SYSTRON DONNER

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SYSTRON DONNER
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RS SERIES

INSTRUMENT DIVISION

POWER
SUPPLIES

DOCUMENT NO. 120024-01

OPERATING AND SERVICE MANUAL

The RS Series Manual consists of:

RS20-20B
RS40-15B
RS60-12B
RS320-4B
RS320-2C

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CHAPTER 1

DESCRIPTION

1.1 INTRODUCTION

The RS Series Power Supply is a flexible and dependable source of DC power which can be used to meet a variety of needs ranging in scope from inspection and production testing, to laboratory bench testing and systems applications.

The wide range of outputs available makes this unit well suited for use as a basic laboratory power source. The ability to provide power packaged in minimum space with high reliability meets the demands of most systems requirements.

This instruction manual provides general characteristics and specifications, operating procedures, theory of operation, troubleshooting, calibration, parts lists and related schematics for this series.

1.2 DESCRIPTION

The low profile RS Series units are designed for laboratory and system applications. Constant Voltage and Constant Current operation is provided with automatic crossover. Automatic Tracking Overvoltage Protection (OV) Option is a Patented automatic fail-safe overvoltage protection circuit. The OV circuit protects the load against receiving a voltage in excess of the programmed output voltage of the supply. The protection point automatically tracks the programmed output voltage.

1.3 GENERAL FEATURES

Automatic short circuit protections, remote voltage programming, remote sensing, no turn on/turn off transients, an overvoltage protection option, an all silicon design and +71°C operation are featured in the RS Series Power Supplies. Output, Sensing, Remote Voltage Programming and Remote Current Programming terminals are located on terminal boards mounted on the rear panel of the unit. The Power switch, power on indicator light, mode indicator light, current and voltage controls and appropriate metering devices are all located on the front panel. For convenience, additional output terminals have been provided on the front panel.

1.3.1 Constant Voltage Mode

A constant voltage is maintained across the output terminals at any preset value from zero to rated voltage output, provided that the load does not draw more than either the rated output current or more than the preset limiting current value determined by the front panel current control settings.

1.3.2 Constant Current Mode

Constant current operation is achieved by maintaining a constant voltage across an internal current sensing resistor. An automatic crossover network changes the mode of operation from Constant Voltage to Constant Current when the current demand reaches that of the preset current adjust control. The point at which the operating mode automatically changes is a function of variations in load conditions. The crossover point is adjustable, and can be established anywhere within the current and voltage range of the unit.

1.3.3 Automatic Current Limiting

Short circuit protection is provided by the Automatic Current Limiting circuit which limits the maximum output current under all load conditions. The point at which automatic current limiting occurs is variable, and may be selected anywhere from 1% of the rated current to the full rated current output of the unit. In the event of a short circuit, the output voltage drops to zero, and return to normal only when the short circuit is removed.

1.3.4 Mode Indicator

A front panel mode indicator light indicates when the unit is operating in either the constant current or current limiting mode of operation.

1.3.5 Automatic Overvoltage Protection (Optional Feature)

Automatic Overvoltage (OV) Protection is available as an option wherein special circuitry automatically tracks the programmed output voltage and prevents it from exceeding this output voltage. The voltage differential that will cause the OV to trip is approximately 5% or 1.5V above the programmed voltage. Minimum OV trip point is approximately 5V.

1.3.6 Remote Programming

Remote Programming is provided in both the voltage and current modes of operation. Both voltage and current may be remotely programmed over their entire ranges. The scale factor for Remote Voltage Programming is shown in Table 2-2. The Remote Current Programming is approximately determined by computing the value of the programming resistor using the formula below:

$$RPGM = 100 \left(1 \frac{\text{Load Current}}{\text{Rated Current}}\right).$$

1.4 PRECAUTIONARY MEASURES

1.4.1 Wire Size

To assure proper regulation under all load conditions, and to prevent severe distortions of the AC line voltage, it is very important to take into consideration the physical size and current handling capabilities of the input power line. Serious losses in regulation and an increase in ripple may result from under rated or over loaded AC input lines. The maximum AC impedance from the breaker box to the power supply input should not exceed 0.75 ohms. See Table 2-1 for recommended wire sizes.

1.4.2 Voltage Regulator and Inverter Inputs

Do not use voltage regulators or inverters as a primary power source. The outputs of these devices are usually not sinusoidal in nature, and if used as the AC source for the power supply, will cause serious loss of regulation of the power supply output. Capacitive input filtering used for semiconductor power supplies require charging to the peak of the rectified AC wave which nonsinusoidal AC sources cannot provide.

1.4.3 Variable Transformer Input

If a variable transformer is to be used to test the power supply for low and high AC line operation, it must be able to supply at least twice the VA requirements of the power supply and load.

1.4.4 Systems Considerations

In systems applications it is recommended that each power supply input power line be run separately to the AC distribution box, in order to minimize cross coupling and interaction between equipment. Do not run sensitive signal leads such as the remote sensing leads in the same cable as the AC input is without shielding. It is strongly recommended that the AC input cables should not be run in close proximity to the output load cable leads, if minimum ripple is desired.

1.4.5 Terminal Post Resistance

All terminals and shorting links serving Outputs, Sensing and Programming must be securely tightened before use. Serious loss of regulation and an increase in ripple can result due to a voltage drop caused by loose terminals and shorting links.

The specifications cited herein for regulation and ripple can be readily attained on every power supply providing the proper method of measurement is employed. The major consideration is that the highly stable meter and oscilloscope, specified in the calibration procedures, must be connected to the sensing terminals and not the load terminals. The reason for this precaution is that the voltage drop between the load terminals and seinsing terminals will yield an inaccurate regulation ripple measurement.

1.5 SPECIFICATIONS

Table 1-1 is a complete list of standard specifications for the RS Series Power Supplies.

TABLE 1-1 SPECIFICATIONS

Constant Voltage Mode with adjustable Current Limiting.

Input:	105-125 Vac, 55-65 Hz (200-240 Vac, (50 to 400 Hz available).
Output:	Floating; isolated from ground, 300 Vdc maximum.
Regulation Line:	0.01% or 3 mV[1], for 105-125 Vac line change at any output within specifications.
Regulation, Load:	0.01% or 3 mV[1] no load to full load at any output within specifications.
Ripple:	Less than 0.5 mV rms.
Stability:	0.05% or 18 mV[1] for 8 hrs. after warm-up. Measured at constant line voltage, load and ambient temperature.
Temperature Coefficient:	(0.02% +400 μV)/°C.
High Stability	0.01% or 2 mV[1] with a T.C. or (0.01% +100 μV)/°C.
Temperature Range:	-20°C to +17°C[2].
Recovery Time:	25 ms to recover within 0.05% or 15 mV[1] of output voltages for 25% change in rated load.
Short Circuit Protection:	Automatic Adjustable Current Limiting variable from 1% to 100% of rated current.
AC Power Input Protection:	Fuse.
Remote Programming (RVP):	All units remotely programmable over output voltage range. See chart for RVP scale factor.
Remote Sensing:	Maintains rated regulation directly at the load. Maximum line drop 0.5V per leg.
Voltage Adjustment Range:	Continuously adjustable 10-turn control.
Overvoltage Protection (Internal Option):	Automatic fast acting overvoltage protection tracks the preset output voltage.

TABLE 1-1 SPECIFICATIONS (Cont'd)

Constant Current Mode with adjustable Voltage Limiting

Current Range:	1% to rated current output.
Voltage Compliance:	0 to rated output voltage.
Regulation, Line:	0.5% I_{rated} for 105-125 Vac line change at any output within specifications.
Regulation, Load:	0.5% I_{rated} output current change for the maximum change in load resistance within the rated voltage compliance range.
Ripple:	0.25% or 5 mA[1].
Stability:	0.5% I_{rated} for 8 hours after warm-up. Measured at constant line voltage, load and ambient temperature.
Temperature Coefficient:	0.1% I_{rated}/°C.
Remote Programming:	Fully programmable over complete current range. Programming resistance $R_{pgm} \cong 100\ (1 - I_{load}/I_{rated})$.
Design Principle:	Phase controlled pre-regulation with precision series pass regulation.
Operational Modes:	Constant Voltage with adjustable current limiting; Constant Current with adjustable voltage limiting; Automatic Crossover.
Mode Indicator:	Front panel mode indicator light indicates when supply is operating in the constant current limiting mode.

Controls

Voltage:	10-turn front panel control; 0 to rated output.
Current:	10-turn front panel control; 1% I_{rated} to rated output.
Input Power:	Front panel switch and indicator.

TABLE 1-1 SPECIFICATIONS (Cont'd)

Metering	
Voltage:	Front panel voltmeter.
Current:	Front panel ammeter.
Size:	All units 19"W x 3-1/2"H x 14-5/8"D. (Except Model RS320 which is 16-1/6"D).
Terminals	
Front Panel:	Positive Output (+V); Negative Output (-V); Ground (G).

TABLE 1-1 SPECIFICATIONS (Cont'd)

Terminals (Cont'd):	
Rear Panel:	(1-2) Remote Current Programming RIP; (3) Ground G; (4-5) Remote Voltage Programming RVP; (6) Negative Sensing -S; (8) Positive Sensing +S; (9) Positive Output +V. (Rear Panel RS320, same as above. Use TB3 for DC outputs -V, -S, +V, +S.)

[1] Whichever is greater.
[2] When stacked without free air circulation temperature should be limited to +60°C.

Model	Volts	Amps	40° C	60° C	71° C	RVP Scale Factor ohms/volt	ΔI	*Impedance DC-1 kHz	Weight (lbs.)
RS20-20BOV	0-20	0-20	20	13	9	100	5	0.001	47
RS40-15BOV	0-40	0-15	15	13	9	125	4	0.002	45
RS60-12BOV	0-60	0-12	12	10	8	83.3	3	0.004	47
RS160-4BOV	0-160	0-4	4	3	2.4	312.5	1	0.005	49
RS320-2C*	0-320	0-2	2	1.5	1.2	312.5	.5	0.020	49

*Overvoltage feature is not available.

CHAPTER 2

INSTALLATION & OPERATION

2.1 MECHANICAL INSTALLATION

2.1.1 Rack Mounting

Any standard EIA relay rack will accommodate the RS Series power supplies in only 3-1/2" of vertical mounting space. Mounting of the unit is easily accomplished by inserting 4 mounting screws through the slotted holes provided in the 4 corners of the front panel of the power supply, and on into the matching threaded holes of the relay rack.

2.1.2 Bench Use

Though designed primarily as a rack mounting unit, the RS Series power supply may be operated in a bench type configuration as well. It is therefore fully enclosed in a protective metal case, and equipped with rubber mounting feet which serve to protect the unit and the surface upon which it rests from scratching, and to provide an airflow channel under the unit for ventilation purposes.

2.2 ELECTRICAL CONNECTIONS

2.2.1 AC Input

The unit is supplied with a heavy duty 3 wire line cord equipped with molded plug and ground strap to provide a path for AC input power.

The power handling ability of the AC power lines feeding AC power to the line cord must be considered, as serious losses in regulation and substantial increases in ripple can occur as a result of insufficient power handling capacity of these lines. The AC impedance from the breaker box to the power supply input connector should not exceed 0.75Ω. Any moveable electric contact surface (such as the wiper arm of a variable transformer) should be kept clear of impedance producing oxide coatings.

Care should be exercised in selecting the proper wire size for the AC input lines. The figures listed in Table 2-1 will serve as a guide in this selection.

TABLE 2-1 AC INPUT WIRE SIZE

Length of Run (Single Lead)	Wire Size (AWG Standards)
10 feet or less	16
10 feet to 20 feet	14
20 feet to 50 feet	12
50 feet to 100 feet	10

2.2.2 Barrier Strips

Two barrier strips mounted on the rear panel provide output, sensing and remote programming connections. See page 1-5 for outline drawing.

2.2.3 DC Output

DC output voltage is available at both front and rear panel locations, and may be sensed (monitored) either at the output terminals of the power supply (Local Sensing) or at the load itself (Remote Sensing).

2.2.4 Local Sensing

Local sensing of the output voltage may be made at the rear panel output terminals. The shorting links must be placed across rear panel terminals -V and -S and terminals +S and +V.

2.2.5 Remote Sensing

Remote sensing of the output voltage is available only if the load is connected to the rear panel output terminals. The shorting links between rear panel terminals -V and -S and terminals +S and +V must be removed, and separate sensing leads installed between sensing terminals -S and +S and the load.

2.2.6 Local Programming

Local programming of either current or voltage is available by shorting the appropriate rear panel terminals. For local current programming operation,

a shorting link should be placed across barrier strip terminals 1 and 2 (RIP). For local voltage programming operation, a shorting link should be placed across barrier strip terminals 4 and 5 (RVP). In both local current programming and local voltage programming operation, the output amplitude is dependent upon the setting of the appropriate front panel adjustment control.

2.2.7 Remote Programming

Remote programming of both voltage and current may be achieved by removing the shorting link from the appropriate barrier strip terminals and substituting a remotely operated adjustment control resistance in its place.

In the remote voltage programming mode of operation, the scale factor required for the remotely operated voltage adjustment control is as shown in Table 2-2. In order for this remotely operated adjustment control to function properly, front panel VOLTAGE ADJUST control must be set fully CCW. Operation of this power supply without either shorting link or remotely operated adjustment control connected across remote voltage programming barrier strip terminals 4 and 5 (RVP), will result in an unregulated output voltage.

The required size of the remote current programming resistor may be determined by use of the formula $Rpgm = 100\left(1 - \frac{\text{Load Current}}{\text{Rated Current}}\right)$

where Rpgm is the remote program resistor, load current refers to the desired output current, and rated current refers to the maximum output current of the unit. To obtain proper operation of the remotely controlled current adjust control, it is necessary that front panel CURRENT ADJUST control be set fully CW. Operation of this power supply without either shorting link or remotely adjusted current programming control connected across remote current programming barrier strip terminals 1 and 2 (RIP) will result in a complete loss of output current.

2.2.8 Shorting Links

The unit is shipped with shorting links in place across terminals 1 and 2, 4 and 5, -S and -V, and +S and +V of the barrier strips. In this configuration, local programming and sensing is available at the barrier strip terminals. Table 2-3 lists the various shorting link connections and their functions.

TABLE 2-2
REMOTE VOLTAGE PROGRAMMING FACTORS

Model	Voltage Range	RVP Scale Factor Ohms/Volt
RS20-20B	0-20 V	100
RS40-15B	0-40 V	125
RS60-12B	0-60 V	83.3
RS160-4B	0-160 V	312.5
RS320-2C	0-320 V	312.5

TABLE 2-3
SHORTING LINK APPLICATION

Terminals	Condition	Function
-S and -V +S and +V	Shorted	Local sensing and regulation at rear panel output terminals.
-S and -V +S and +V	Ext. Sense Leads	Remote sensing and regulation at load.
4 and 5	Shorted	Voltage programmed locally, output dependent upon voltage adjust potentiometers.
4 and 5	Ext. PGM Res.	Voltage programmed remotely, output dependent upon size of PGM resistor.
1 and 2	Shorted	Current programmed locally, output dependent upon current adjust potentiometers.
1 and 2	Ext. PGM Resistor	Current programmed remotely output dependent upon size of PGM resistor.

2.3 CONTROLS

2.3.1 Front Panel

TABLE 2-4
FRONT PANEL CONTROLS

Symbol	Name	Function
S1	AC POWER	Power switch, controls input power.
R66 (R56 on C Version)	VOLTAGE ADJUST	10-turn potentiometer, adjusts voltage output.
R12 (R77 on C Version)	CURRENT ADJUST	10-turn potentiometer, adjusts current.

2.3.2 Internal

All internal control settings have been factory preset, and require no additional adjusting. However, if it should become necessary to adjust any of the internal controls due to circuit changes caused by component aging or replacement, refer to the calibration section of this instruction manual.

2.4 OPERATION

2.4.1 Control Settings

Set all front panel controls fully CW so that unit will operate in the Voltage rather than Current Limiting mode.

2.4.2 Shorting Links

If Local Sensing rather than Remote Sensing operation is desired, ascertain that shorting links are in place across the appropriate terminals.

2.4.3 Grounding

Either side of the Output may be grounded, or the output may be used in a floating condition.

2.4.4 Power On

Connect the power supply to a suitable source of 115 Vac, 60 cycle power. Set POWER switch S1 to AC-ON, and observe that pilot lamp DS1 glows.

2.4.5 Warm-Up

No warm-up time is necessary to place the unit into operation. However, a 30 minute warm-up period is recommended to reach rated stability.

2.4.6 Series Operation

To operate two or more power supplies in a series configuration, connect the output of each power supply in series. When operating in this mode, it is necessary to adjust the output of each unit independently. The output voltage is equal to the sum of the voltage settings of each power supply.

2.4.7 Parallel Operation

1) With rated resistive load connected across the output of power supply A as shown in Figure 2-2A, set VOLTAGE ADJUST control to desired output voltage, and set CURRENT ADJUST control for maximum rated output current.

2) Connect power supply B as shown in Figure 2-2B. With no load across the output, set VOLTAGE ADJUST control for an output voltage 2V higher than the output voltage of power supply A. Place a short across the output terminals, and set the CURRENT ADJUST control 1/2 the total load current requirement.

3) Remove all former output loads and connect the outputs of power supplies A and B in parallel with each other, and in parallel with the load, as shown in Figure 2-3.

4) If parallel operation of these two power supplies is desired for a systems application, it is important that both units be turned on simultaneously. It is therefore recommended that both power supplies be connected to a single large circuit breaker. Maximum output current will be twice that of either of the two power supplies, while minimum output current will be that of power supply B or half the total load current.

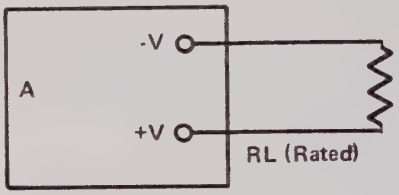


FIGURE 2-2A

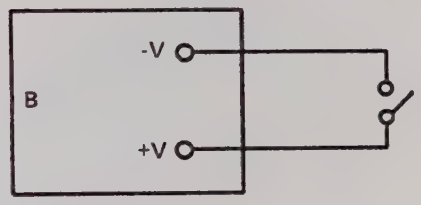


FIGURE 2-2B

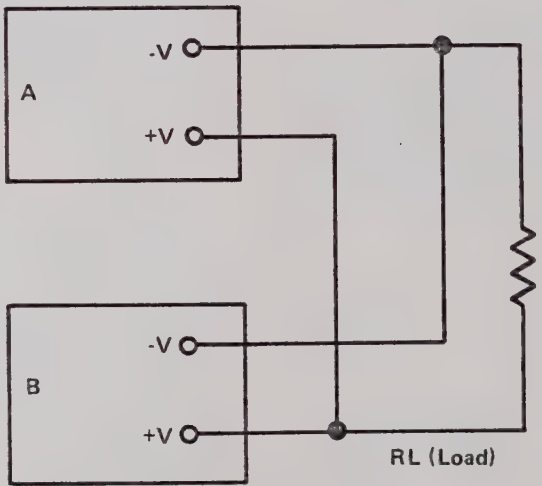


FIGURE 2-3

NOTE: If parallel operation of power supply utilizing Overvoltage (OV) Protection is desired, consult the factory for special instructions.

CHAPTER 3

THEORY OF OPERATION

3.1 GENERAL

The purpose of the RS Series power supplies is to transform and rectify the AC input into a well-regulated, stable and adjustable DC output. The following paragraphs describe the major circuits used in the power supplies. As each circuit is described, reference should be made to both the Block Diagram, Figure 3-1 and the Schematic Diagram in the rear of this manual.

NOTE: Any circuit references applicable to the Model RS320-2C are shown in parenthesis if different than the lower voltage models.

3.1.1 Primary Input

Input power is obtained through power transformer T1 (T1,T2) and full wave silicon diode rectifiers. Each pair of rectifiers provide the necessary DC voltages to the various sections of the unit.

When AC power switch S1 is set to AC-ON, AC pilot lamp DS1 glows, and AC power is applied to the power transformers. Regulated DC output power is immediately available from the power supply.

3.1.2 Reference Supply

The rectified and filtered voltage from rectifiers CR1 and CR2 and filter capacitor C1 is pre-regulated by Coarse Reference Regulator Zener CR13 (CR3). This provides a stabilized DC voltage to Constant Current Source Q2, whose output is regulated by Precision Voltage Reference Zener CR14 (CR4). Constant Current Source Q1 controls the drive to Q2 and in turn is controlled by Q2. The voltages developed across Constant Current Source References CR14 (CR4) and CR15 (CR16) are highly stable reference voltages established at a higher positive potential than the positive output of the main supply.

3.1.3 Pre-Regulator

The purpose of the Pre-Regulator section is to maintain the unregulated input voltage in Input Filter Capacitor C8 (C22) at a suitable value compared to the output voltage in order to control the power dissipated by the Series Regulator.

The method used to accomplish this is to "fire" a pair of SCR's (silicon controlled rectifiers), CR9 (CR27) and CR10 (CR28) at controlled points along the input sinewave to increase or decrease the potential to which the input filter capacitor may charge. The SCR's are 'fired' (allowed to pass current) by the application of a positive pulse at the junction of gating resistors R35 (R57) and R37 (R58) from amplifier Q25 (Q11), which amplifies the triggering pulse from unijunctions transistor Q12 (Q13). The unijunction transistor triggers the SCR's when charged sufficiently by timing capacitor C13 (C10) to cause conduction. The SCR's are turned off with each alternate half cycle of the input sinewave.

3.1.4 Series Regulator

The pre-regulated DC voltage from the SCR's is directed through the Series Pass transistors. The conduction of these transistors is controlled by circuitry which causes them to act as variable resistors. Their overall resistance varies in accordance with the need of the power supply to increase or decrease its output voltage or current.

The Series Pass transistors are controlled by several driver stages which amplify signals from the error amplifier.

3.1.5 Comparator and Error Amplifier

The voltage sensing and comparison is accomplished by differential amplifiers Q10 (Q9) and Q11 (Q10). A sample of the output voltage on the base of Q11 (Q10) is compared to the stable reference voltage

on the base of comparator Q10 (Q9). An unbalance caused by a change in voltage adjustment control R66 (R56) will appear as a voltage change in the collector of Q11 (Q10).

This difference voltage is amplified by error amplifier Q7 (Q6), and is used to regulate the Series Pass transistors via the Series Pass drivers. Error amplifier Q7 (Q6) has two diode inputs to its base which form an OR gate for error signals. CR19 (CR7) supplies error signals from the comparator, and CR18 (CR6) supplies an error signal in the event of a short circuit, or if the power supply is driven into the current limiting mode of operation.

When operating in the current limiting mode, differential amplifier Q3 and Q4 become balanced, causing diode CR19 (CR6) to conduct, and in turn drives error amplifier Q7 (Q6) toward cut-off. This signal also causes Q8 (Q7) to conduct, thereby causing current mode indicator lamp DS2 to glow.

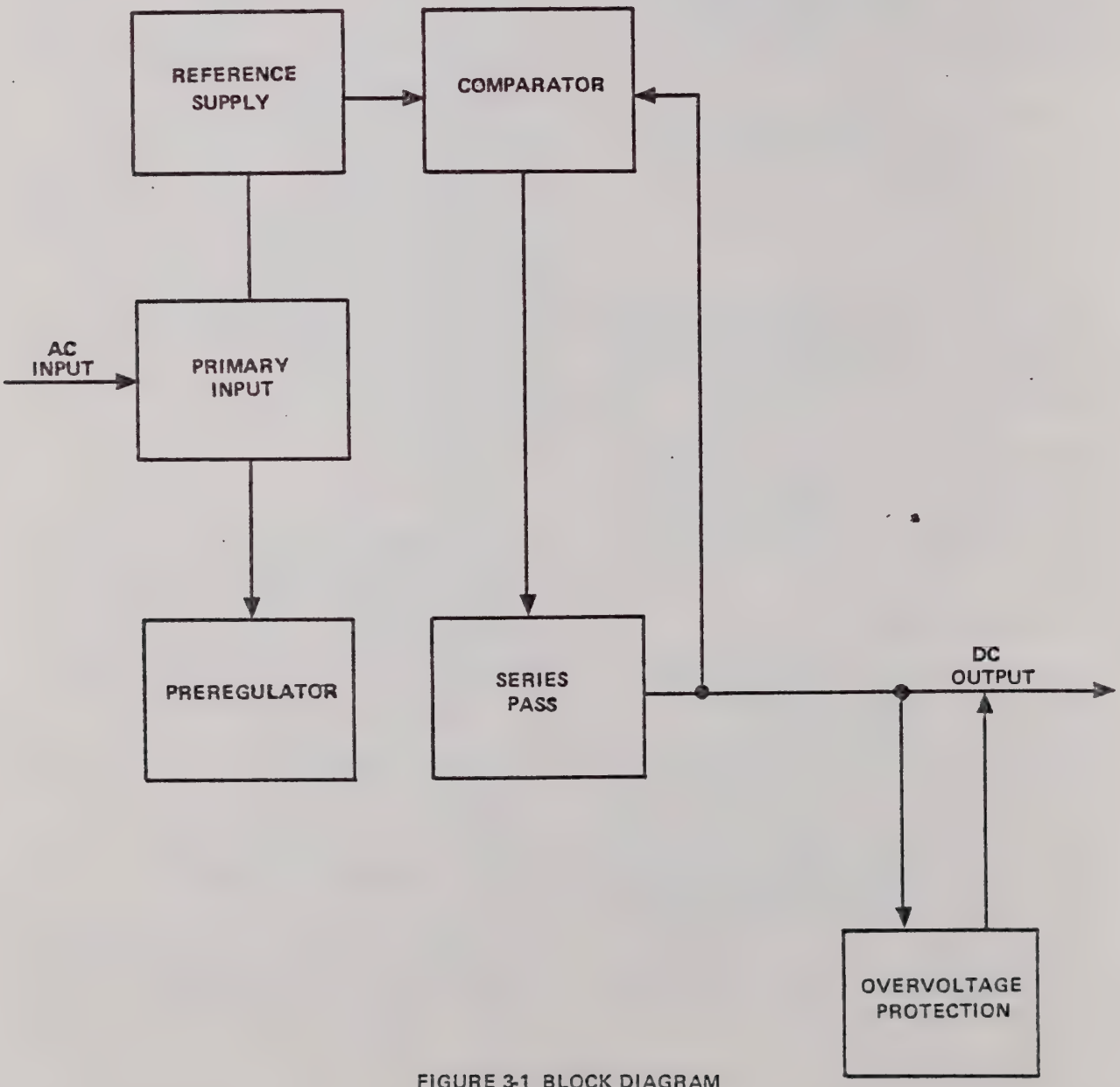


FIGURE 3-1 BLOCK DIAGRAM

CHAPTER 5

MAINTENANCE

4.1 GENERAL

This power supply is a precision instrument. It is strongly recommended that only experienced troubleshooting personnel perform troubleshooting operations or attempt to repair the unit. If the power supply appears to be malfunctioning at all, the following procedure is recommended for isolating possible defects.

WARNING

High Voltages are Present
USE CAUTION

4.2 LOADS AND INTERCONNECTIONS

1) Disconnect all loads and interconnections.

2) Connect a resistive load across the output terminals, and operate the unit to determine whether the fault lies within the unit or externally. Observe that shorting links are in place across terminals 1 and 2, 4 and 5, -V and -S and +V and +S, and that all connections are tightly made.

4.3 TROUBLESHOOTING

1) Set the VOLTAGE ADJUST controls fully CW. Use a 20,000 ohms per volt voltmeter or digital voltmeter to check the schematic located in the rear of the manual. Any reading which is grossly incorrect indicates that the stage being tested or the one immediately preceding it, is defective. The Block Diagram, Schematic Diagram and appropriate sections of the Theory of Operation will prove helpful in any troubleshooting work. Proper polarity to be observed when testing can be easily obtained from the Schematic Diagram.

2) If voltage checks shown no deviations from the prescribed values, disconnect AC power and proceed with point to point resistance checks across potentiometers, switches, diodes, resistors, transistors, in that order.

3) When the trouble is of an intermittent nature such as poor regulation, ripple, etc., the use of an oscilloscope to determine dynamic changes will be necessary.

CHAPTER 5

CALIBRATION

5.1 GENERAL

The following adjustments should be made when necessary to assure optimum operating characteristics and maximum efficiency of the power supply.

5.2 TEST EQUIPMENT REQUIRED (Or Equivalent)

1) Oscilloscope, Tektronix Type 561

2) Differential Amplifier Plug In, Tektronix Type 63.

3) Time Base Plug In, Tektronix Type 67

4) Digital Multimeter, Systron Donner Model 7004A

5) Variable Auto Transformer, Powerstat Type 3PN136

5.2.1 Shorting Link Application

For test purposes, shorting links should be connected across terminals 1 and 2, 4 and 5, -V and -S and +V and +S, to provide local sensing and local programming. To reduce pick up, shielded wire must be used for all connections between test equipment and the power supply being tested. To prevent ground loops, it is important that only one ground connection be made, as shown in Figure 5-1 and Figure 5-2. Tighten all terminal connections as securely as possible, and set all front panel controls fully CW.

5.3 CALIBRATION PROCEDURE

NOTE: Any circuit references applicable to the Model RS320-2C are shown in parenthesis if different than the lower voltage models.

5.3.1 Voltage Adjust Control

1) MAXIMUM VOLTAGE: Set front panel VOLTAGE ADJUST control fully CW. Adjust Maximum Voltage control R67 (R24) to obtain an output voltage 0.5 Vdc in excess of the maximum rated output voltage.

5.3.2 Maximum Current

1) MAXIMUM CURRENT: Connect a test ammeter having a full scale current indicating capacity of 150% that of the rated current output across the output terminals of the power supply. (Set all front panel controls fully CCW.) Apply power to the unit under test and slowly rotate CURRENT control fully CW. Observe that the maximum current obtainable is approximately 110% that of the maximum rated current output. If it is not possible to achieve 110% of the maximum rated current output, adjust Maximum Current control R6 ((R72) until that value is attained. Set AC POWER switch to OFF.

Connect a suitable load resistance across the output terminal connections. The load resistance must be able to dissipate the rated power of the unit (P = IE) and must be of sufficient value to yield the rated output current when the rated voltage is applied. Set AC POWER switch to ON. Note the voltage indicated on the Digital Multimeter. Disconnect the resistive load from the output and observe the voltage indicated on the Digital Multimeter. The maximum change in output voltage should not exceed by more than 0.01% or 3 mV (whichever is greater) that of the output voltage indicated with the load resistance applied across the output terminals.

If it is not possible to maintain the load regulation as stated in the preceding paragraph, readjust Maximum Current control R6 (R72) slightly and recheck the load regulation.

2) MINIMUM CURRENT: With no load on power supply, set the VOLTAGE ADJUST control to maximum (CW) and CURRENT ADJUST control to minimum (CCW). Adjust R11 (R80) until the voltmeter indicates a collapse. Turn CURRENT ADJUST control slightly CW, voltage should come back up with only this slight rotation. If it requires too much rotation then readjust R11 (R80) again. This should put the minimum current adjust setting at approximately 1% of maximum rating.

5.3.3 Constant Voltage Operation

1) LOAD REGULATION: With the equipment connected as shown in Figure 5-1, connect a suitable load resistance across the output terminal connections. The load resistance selected must be able to dissipate the rated power of the unit (P = IE) and must be of sufficient value to yield the rated output current when the rated voltage is applied. Note the voltage indicated on the Digital Multimeter. Disconnect the resistive load from the output. The maximum change in output DC voltage indicated on the Digital Multimeter should not exceed by more than 0.01% or 3 mV (whichever is greater) that of the output voltage indicated with the load resistance applied across the output terminals.

2) LINE REGULATION: Place the resistive load across the output and note the voltage indicated on the Digital Multimeter. (Vary the input line voltage ±10%. The maximum change in output voltage should not exceed by more than 0.01% or 3 mV (whichever is greater) that of the output voltage measured at either extreme of the AC input.

3) RIPPLE VOLTAGE: In order to reduce pickup, shielded test leads should be used in making ripple measurements. With the resistive load connected across the output terminals, measure the AC ripple with the Digital Multimeter. Vary the AC input power 10% above and below the nominal AC input level. The maximum ripple amplitude should not exceed 0.5 mV rms.

5.3.4 Constant Current Operation

1) LOAD REGULATION: With the equipment turned off, disconnect the resistive load from the output terminals. Connect a small current sensing resistor in series with the resistive load and then connect the load back across the output terminals. Selection of the proper value for the current sensing resistor may be easily made using the formula $RS = \frac{I}{IR}$ where RS = Value of Current Sensing Resistor and IR = Rated Load Current. Connect the equipment as shown in Figure 5-2, and apply power to the power supply

Vary the VOLTAGE ADJUST control and resistive output load as necessary, to achieve rated current and voltage output. Decrease the load resistance until current meter reading exceeds full scale indication. Rotate CURRENT ADJUST control CCW to return the current meter reading to full scale. Observe that the output voltage has decreased from its previous full scale reading, and that increasing the VOLTAGE ADJUST control has no effect upon the output voltage or current. This indicates that the unit is now operating in the Constant Current Mode.

Measure the voltage across the small sensing resistor. Compute and note the current flow throught this resistor. Change the output load from the resistive load previously used, to a short. Again measure the voltage across the small sensing resistor and compute the value of the current flow through this resistor. The change in current should not exceed by more than 0.5% the rated current previously noted with a full resistive load across the output.

2) LINE REGULATION: Replace the resistive load across the output and measure the voltage drop across the small sensing resistor. Compute and note the current flow $(I = \frac{E}{R})$ through this resistor.

Vary the input line voltage ±10%. Note the maximum change in voltage across the sensing resistor and compute the maximum current flow. The maximum change in current should not exceed by more than 0.5% the rated current previously noted at either extreme of the AC input.

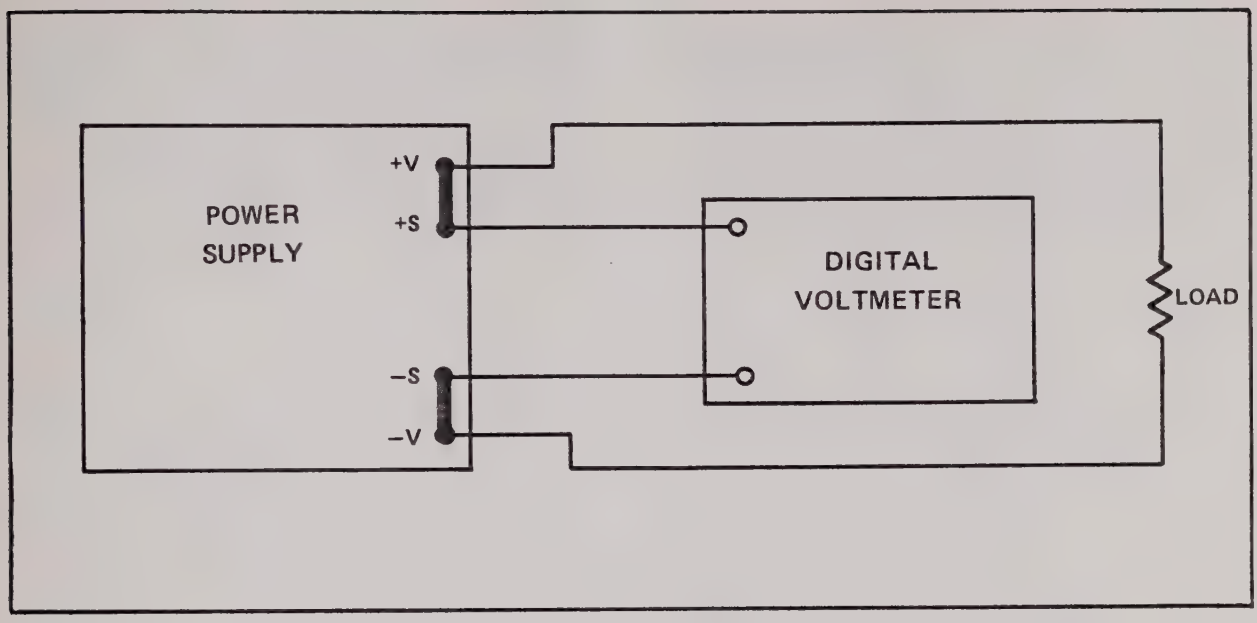


FIGURE 5-1 CONSTANT VOLTAGE OPERATION

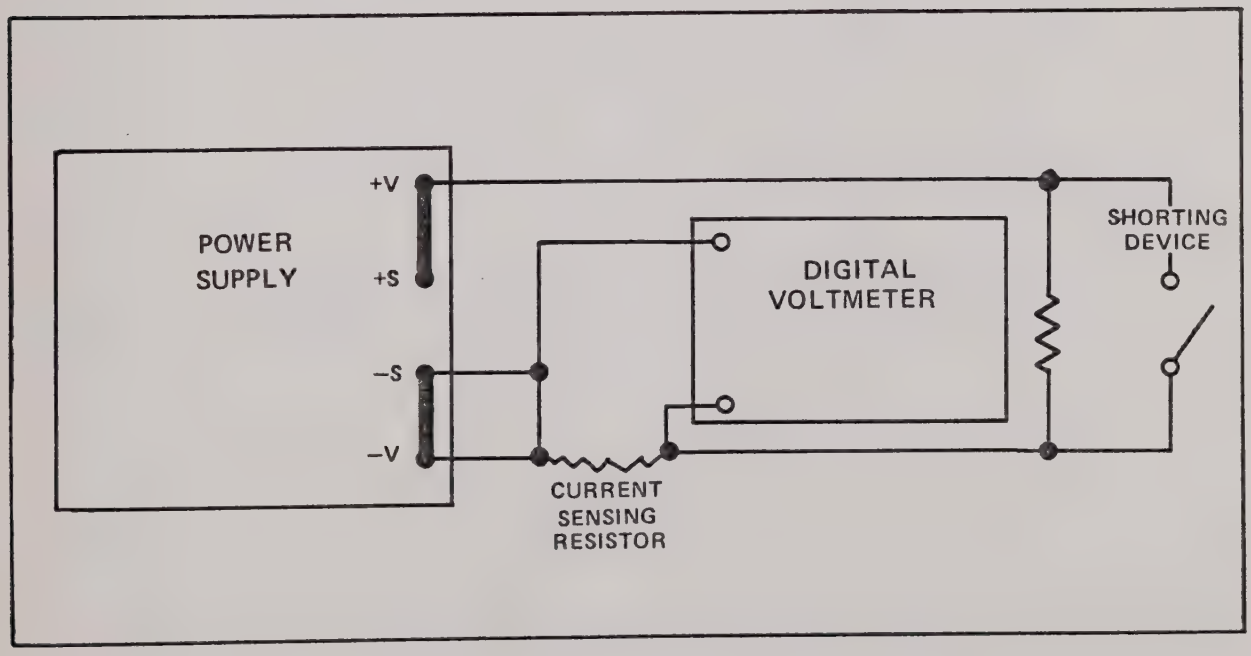


FIGURE 5-2 CONSTANT CURRENT OPERATION

3) RIPPLE CURRENT: With the AC input line voltage adjusted to the nominal AC input voltage and the resistive load connected across the output, measure the amplitude of the AC ripple as seen across the sensing resistor with the Digital Multimeter. Compute and note the current flow. Vary the AC input line voltage ±10%. Measure the maximum voltage drop and compute the maximum current flow. The maximum ripple current must not exceed by more than 0.25% or 5 mA (whichever is greater) that of the current flow noted during nominal input line voltage.

TROUBLESHOOTING GUIDE FOR MODEL RS320-2C

SECTION	COMPONENT	DC VOLTS ±10%
Reference	CR3	24.0
	CR4	5.1
	CR16	9.3
	R9	2.6
Pre-Regulator	C22	340
Series Regulator	C29	300
	Q15,Q16 Collector to Emitter	15
	CR31	13
Comparator and Error Amp.	Q6(B to E)	0.7
	Q9,Q10(B to E)	0.65
	R18	6.2
	R19	3.1
	R21	3.3
	R23	2.5

NOTE

Base to emitter voltages of all transistors in the Series Regulator should be positive for conduction. Power Supply is set to rated output voltage and current.

CHAPTER 6

PARTS LIST

6.1 INTRODUCTION

This chapter contains the parts list for each assembly in the RS Series Power Supplies. Chapter 7 shows the drawings where the listed parts are installed. Ordering information is included and should be used when purchasing parts from the factory. Explanation of the column listings and Table 6-1 Manufacturer's Code-To-Name Index are also included.

6.2 PART ORDERING INFORMATION

To order a part from the Replaceable Parts List, state the Systron Donner part number, and indicate the quantity required and address the order to the nearest Systron Donner Sales or Service Center.

To order a part not listed in the Replaceable Parts List, state the instrument model number, instrument serial number, the description and function of the part and the number of parts required. Address the order to the nearest Systron Donner Sales or Service Center.

6.3 PARTS LIST

Each column in the parts lists provide specific information relating to the listed parts.

TABLE 6-1 MANUFACTURER'S CODE-TO-NAME INDEX

Code	Name & Address
01121	Allen-Bradley Co. . 1201 So. 2nd Street Milwaukee, WI 53204
02735	RCA Corp. Solid State Division Route 202 Somerville, NJ 08876
03508	General Electric Co. Semiconductor Products Dept. Electronics Park Syracuse, NY 13201
03877	Transitron Electronic Corp. 168 - 186 Albion Street Wakefield, MA 01880
04713	Motorola Semiconductor Products Inc. 5005 E. McDowell Road Phoenix, AZ 85008
06540	Amatom Electronic Hardware Division of Mite Corp. 81 Rockdale Avenue New Rochelle, NY 10806
07263	Fairchild Camera & Instrument Corp. Semiconductor Division 313 Frontage Road Mountain View, CA 94040
08289	Delbert Blinn Co. Inc. P.O. Box 2007 1678 Mission Blvd. Pamona, CA 91766
11236	CTS of Berne Inc. 406 Parr Road Berne, IN 46711
11534	Duncan Electronics Inc. 2865 Fairview Road Costa Mesa, CA 92626
12579	Huntington Electronics Corp. 14736 Arminta Street Van Nuys, CA 91402
12697	Clarostat Mfg. Co. Inc. Lower Washington Street Dover, NH 03802
13103	Thermalloy Co. 2021 W. Valley View Lane Dallas, TX 75234
15915	Tepro of Florida Inc. 2608 Enterprise Road Dunedin, FL 33528
16758	Delco Radio Division of General Motors Corp. Kokomo, IN.
17117	Electronic Molding Corp. 96 Mill Street Woonsocket, RI 02895
19701	Mepco/Electra Inc. Electra Division P.O. Box 760 Mineral Wells TX 76067
22753	UID Electronics 4105 Pembroke Road Hollywood, FL 33021
52542	Systron Donner Corp. Instrument Division 2727 Systron Drive Concord, CA 94518
52763	Stettner - Trush Inc. 67 Albany Street Cazenovia, NY
56289	Sprague Electronic Co. North Adams, MA 01247
58474	Superior Electric Co. 383 Middle Street Bristol, CT 06010
70903	Belden Corp. 415 So. Kilpatrick Chicago, IL 60644
71400	Bussmann Mfg. Division of McGraw-Edison Co. 2536 W. University Street St. Louis, MO 63017
71450	CTS Corp. Elkhart, IN 46514

TABLE 6-1 MANUFACTURER'S CODE-TO-NAME INDEX (Cont'd)

Code	Name & Address
71590	Globe-Union Inc. Centralab Electronics Division 5757 No. Green Bay Avenue Milwaukee, WI 53201
71744	Chicago Miniature Lamp Works 4433 Ravenswood Avenue Chicago, IL 60640
72982	Erie Technological Products Inc. 644 W. 12th Street Erie, PA 16512
73138	Beckman Instruments Inc. Helipot Division 2500 Harbor Blvd. Fullerton, CA 92634
73734	Federal Screw Products Inc. 3917 N. Kenzie Avenue Chicago, IL 60618
74970	E.F. Johnson Co. 299 - 10th Avenue S.W. Waseca, MN 56093
75042	TRW Electronic Components Fixed Resistors Philadelphia Division 401 N. Broad Street Philadelphia, PA 19108
75382	Kulka Electric Corp. 633 - 643 S. Fulton Avenue Mt. Vernon, NY 10550
75915	Littlefuse Inc. 800 E. Northwest Hwy. Des Plaines, IL 60016
79963	Zierick Mfg. Co. Radio Circle Mt. Kisco, NY 10549
80294	Bourns Inc. Instrument Division 6135 Magnolia Avenue Riverside, CA 92506
81349	MIL STD
81483	International Rectifier Corp. 9220 Sunset Blvd. Los Angeles, CA 90069
82389	Switchcraft Inc. 5555 N. Elston Avenue Chicago, IL 60630
83777	E-Systems Inc. Memcor Division 41 E. Park Drive Huntington, IN 46750
91418	Radio Materials Co. 41441 W. Bryn Mawr Chicago, IL 60646
91637	Dale Electronics Inc. P.O. Box 609 Columbus, NB 68601
91802	Industrial Devices Inc. 982 River Road Edgewater, NJ 07020
92194	Alpha Wire Corp. Elizabeth, NJ

TITLE: RS SERIES SHIPPING ASSEMBLY

ITEM	REF	USED ON	COMPONENT DESCRIPTION	MFR'S CODE	MANUFACTURER'S PART NUMBER	SD STOCK NUMBER	T/Q
		1	ASSEMBLY, Shipping	52542	T065100	T065100	1
		2	ASSEMBLY, Shipping	52542	T065200	065200	1
		3	ASSEMBLY, Shipping	52542	T065300	065300	1
		4	ASSEMBLY, Shipping	52542	T065400	T065400	1
		1-4	COVER	52542	T040100	T040100	1
			CHASSIS ASSEMBLY				
		1	ASSEMBLY, Chassis	52542	PD26260	PD26260	1
		2	ASSEMBLY, Chassis	52542	PD26262	PD26262	1
		3	ASSEMBLY, Chassis	52542	PD26264	PD26264	1
		4	ASSEMBLY, Chassis	52542	PD26266	PD26266	1
	C1	1-4	CAPACITOR, El Can 950 μF, 50V	52542	820051	820051	1
	C8	1	CAPACITOR, El Can 8600 μF, 40V	52542	820464	820464	1
	C8	2	CAPACITOR, El Can 34800 μF, 50V	52542	820398	820398	1
	C8	3	CAPACITOR' El Can 23400 μF, 75V	52542	820388	820388	1
	C8	4	CAPACITOR, El Can 6000 μF, 200V	52542	820278	820278	1
	C9	4	CAPACITOR, El Can 160 μF, 250V	52542	820023	820023	1
	C10	1	CAPACITOR, El Can 12400 μF, 40V	52542	820334	820334	1
	C10	2	CAPACITOR, El Can 9300 μF, 50V	52542	820317	820317	1
	C10	3	CAPACITOR, El Can 4500 μF, 75V	52542	820279	820279	1
	C10	4	CAPACITOR, El Can 1700 μF, 200V	52542	820143	820143	1
	C22	1-4	CAPACITOR, .15 μF			800228	1
	C42	1-4	CAPACITOR, Ceramic .022 μF,500V	72982	841-000-Z5V2032	106489	1
	C43	1-3	CAPACITOR, Ceramic .22 μF,400V	52542	800254	800254	1
	C43,44	4	CAPACITOR, Ceramic .22 μF,400V	52542	800254	800254	2
	C47	1-4	CAPACITOR, Tant 20 μF, 50V	56289	40D206F050D02	810021	1
	CR25	1-4	DIODE, Rectifier 300V	04713	1N1202A	720133	1
	R1	1-4	RESISTOR, WW 100 Ω 5%, 1/2W	75042	BWH	640350	1
	R14	1	RESISTOR, WW 0.1 Ω, 25W	75042	BWH	650040	2
	R14	2	RESISTOR, WW .07 Ω, 25W	75042	BWH	650025	1
	R14	3	RESISTOR, WW .1 Ω, 25W	75042	BWH	650040	1
	R14	4	RESISTOR, WW .25 Ω, 25W	75042	BWH	650056	1
	R39	1,2	RESISTOR, WW 500 Ω 5%, 25W	12697	VP25K	650660	1
	R39	3	RESISTOR, WW 1 k 5%, 25W	12579	FVT25	650690	1
	R40	4	RESISTOR, WW 5 k 5%, 50W	12697	VP5K	650804	1
	R60	1-4	RESISTOR, CC 330 Ω 5%, 5W	01121	EB3315	101474	1
	R71	1-4	RESISTOR, CC 820 Ω 5%, 1/2W	01121	EB8215	101656	1
	R78	1	RESISTOR, CC 300 Ω 5%, 5W	01121	EB3015	640420	1
	R78	2	RESISTOR, CC 800 Ω 5%, 5W	01121	EB8015	640494	1
	R78	3	RESISTOR, CC 2 k 5%, 5W	01121	EB2025	640530	1
	R78	4	RESISTOR, WW 1 k 5%, 50W	12697	VP1K	650710	1
	R92	1	Same as R14				
	T1	1	TRANSFORMER	52542	505510	505510	1
	T1	2	TRANSFORMER	52542	505520	505520	1

Used On Code: 1 = RS20-20 BOV 2 = RS40-15 BOV 3 = RS60-12 BOV 4 = RS160-4 BOV

TITLE RS SERIES SHIPPING ASSEMBLY (Cont'd)

ITEM	REF	USED ON	COMPONENT DESCRIPTION	MFR'S CODE	MANUFACTURER'S PART NUMBER	SD STOCK NUMBER	T/Q
	T1	3	TRANSFORMER	52542	505530	505530	1
	T1	4	TRANSFORMER	52542	505550	505550	1
	T2	4	TRANSFORMER	52542	504215	504215	1
		1-4	TRANSFORMER, Mtg. Bracket	52542	T0464002	T0464002	4
		4	BRACKET, Resistor	52542	076358	076358	2
		1-4	CLAMP, Cable 1/4	52542	T930070	T930070	3
		1-4	CLAMP, Cable 7/16	52542	T930090	T930090	3
		1-4	WASHER, Cap	52542	T99000	T99000	4
		1-4	CLAMP, Cap	56289	CM5-22	100725	1
		1-4	BRACKET, Cap	52542	T900068	T900068	1
		1-4	BRACKET, Cap	52542	T046598	T046598	2
		1-4	BRACKET, Left	52542	T028728	T028728	2
		1-4	BRACKET, Support	52542	122642	122642	1
		1-4	FEET, Rubber	52542	840192	840192	4
		1-4	RING, Insulator	52542	T990350	T990350	1
		1-4	WASHER, Nylon	52542	T990331	T990331	4
		1-4	STRIP, Terminal	52542	850033	850033	1
		1-4	SPACER, Ceramic	52542	860040	860040	1
		1-4	HANDLE	52542	T920040	T920040	2
		1-4	NAME PLATE	52542	T101040	T101040	1
	L3	4	ASSEMBLY, Choke	52542	PD26946	PD26946	1
			FRONT PANEL ASSEMBLY				
		1	ASSEMBLY, Front Panel	52542	PD25905	PD25905	1
		2	ASSEMBLY, Front Panel	52542	PD25928	PD25928	1
		3	ASSEMBLY, Front Panel	52542	PD25960	PD25960	1
		4	ASSEMBLY, Front Panel	52542	PD25974	PD25974	1
	DS1	1-4	LITE, Pilot	91802	1040D32	770020	1
	DS2	1-4	INDICATOR, Lite	91802	2190A87	770023	1
	J1	1-4	BINDING POST, Red	58474	DF31RC	T920220	1
	J2	1-4	BINDING POST, Black	58474	DF31BC	T920180	1
	J3	1-4	BINDING POST, White	58474	DF31WTC	T920210	1
	M1	1	ASSEMBLY, Meter 20A	52542	06507701	06507701	1
	M1	2	ASSEMBLY, Meter 15A	52542	06507601	06507601	1
	M1	3	ASSEMBLY, Meter 12A	52542	06504501	06504501	1
	M1	4	ASSEMBLY, Meter 4A	52542	06504301	06504301	1
	M2	1	ASSEMBLY, Meter 20V	52542	06507102	06507102	1
	M2	2	ASSEMBLY, Meter 15V	52542	06507202	06507202	1
	M2	3	ASSEMBLY, Meter 12V	52542	06507302	06507302	1
	M2	4	ASSEMBLY, Meter 4V	52542	06507402	06507402	1
	R12	1-4	RESISTOR, Variable 200 Ω 5%, 2W	11534	3253	600088	1
	R66	1	RESISTOR, Variable 2 k 5%, 2W	80294	3540S-1-202	600209	1
	R66	2,3	RESISTOR, Variable 5 k 3%, 2W	11534	35045-1-502	600317	1
	R66	4	RESISTOR, Variable 50 k 10%, 2W	80294	3540-1-503	102913	1

Used On Code: 1 = RS20-20 BOV 2 = RS40-15 BOV 3 = RS60-12 BOV 4 = RS160-4 BOV

TITLE: RS SERIES SHIPPING ASSEMBLY (Cont'd)

ITEM	REF	USED ON	COMPONENT DESCRIPTION	MFR'S CODE	MANUFACTURER'S PART NUMBER	SD STOCK NUMBER	T/Q
	S1	1-4	SWITCH			880030	1
		1	LABEL	52542	781143	781143	1
		2	LABEL	52542	781147	781147	1
		3	LABEL	52542	781149	781149	1
		4	LABEL	52542	781153	781153	1
		1-4	RING, Nut	52542	T980120	T980120	1
		1-4	KNOB	52542	T920073	T920073	2
			TRANSISTOR BRACKET ASSEMBLY				
		1,2	ASSEMBLY, Transistor Bracket	52542	PD25909	PD25909	1
		3	ASSEMBLY, Transistor Bracket	52542	PD25955	PD25955	1
		4	ASSEMBLY, Transistor Bracket	52542	PD25978	PD25978	1
	CR13	1-4	DIODE, Zener 24V	04713	1N2986A	720241	1
	Q17	1-3	TRANSISTOR, Selected SINPN	52542	705071	705071	1
	Q17	4	TRANSISTOR, Zener 24V	04713	1N2986A	720241	1
		1-4	SOCKET, Transistor	52542	830070	830070	1
		1-4	STANDOFF, #4	17117	2304-14-1	860020	2
			REAR PANEL ASSEMBLY				
		1	ASSEMBLY, Rear Panel	52542	PD25927	PD25927	1
		2	ASSEMBLY, Rear Panel	52542	PD25940	PD25940	1
		3	ASSEMBLY, Rear Panel	52542	PD25963	PD25963	1
		4	ASSEMBLY, Rear Panel	52542	PD25986	PD25986	1
		1,2	ASSEMBLY, AC Input	52542	PD25916	PD25916	1
		3	ASSEMBLY, AC Input	52542	PD25952	PD25952	1
		4	ASSEMBLY, AC Input	52542	PD25985	PD25985	1
	F1	1,2,4	FUSE, Slo-Blo 15A			870212	1
	F1	3	FUSE, Slo-Blo 20A			870222	1
		1-4	RECEPTICLE, Power	82389	EAC-301	101288	1
		1-4	HOLDER, Fuse	75915	345001	117377	1
		1-4	LINE CORD	70903	17502	117680	1
		1-4	PLATE	52542	T046500	T046500	1
		1,2,4	LABEL, Fuse	52542	780680	780680	1
		3	LABEL, Fuse	52542	780680	780680	1
			DC OUTPUT ASSEMBLY				
		1,2	ASSEMBLY, DC Output	52542	PD25911	PD25911	1
		3	ASSEMBLY, DC Output	52542	PD25957	PD25957	1
		4	ASSEMBLY, DC Output	52542	PD25980	PD25980	1
	C5,12	1-4	CAPACITOR, MF .047 μF 10%, 400V	52763	MKT1813-347/40	800155	2
	C11	1,2	CAPACITOR, El Ax 10 μF, 50V	56289	TE1304	106445	1
	C11	3	CAPACITOR, El Ax .8 μF, 100V			810011	1
	C11	4	CAPACITOR, El Ax .47 μF, 200V			800285	1
		1-4	PLATE, DC Output	52542	T046420	T046420	1
		1-4	STANDOFF, #6	17117	3023-14-1	860070	1

Used On Code: 1 = RS20-20 BOV 2 = RS40-15 BOV 3 = RS60-12 BOV 4 = RS160-4 BOV

TITLE: RS SERIES SHIPPING ASSEMBLY (Cont'd)

ITEM	REF	USED ON	COMPONENT DESCRIPTION	MFR'S CODE	MANUFACTURER'S PART NUMBER	SD STOCK NUMBER	T/Q
		1-4	INSULATOR	52542	060938	060938	1
		1-4	BLOCK, Terminal	52542	851105	851105	1
		1-4	BLOCK, Terminal	52542	851204	851204	1
		1-4	LINKS, Barrier Strip	75382	600J	840217	2
		1-4	LINKS, Barrier Strip	52542	840216	840216	2
			HEAT SINK ASSEMBLY #1				
		1	ASSEMBLY, Heat Sink	52542	PD25906	PD25906	1
		2	ASSEMBLY, Heat Sink	52542	PD25920	PD25920	1
		3	ASSEMBLY, Heat Sink	52542	PD25952	PD25952	1
		4	ASSEMBLY, Heat Sink	52542	PD25975	PD25975	1
	C45	1-4	CAPACITOR, .1 μF, 100V			800176	1
	CR7,8	4	DIODE, Rectifier 300V	04713	1N1203A	720133	2
	CR10	1	DIODE, SCR 50V	03508	C228F	720008	1
	CR10	2,3	DIODE, SCR 200V	03508	C35B	720000	1
	CR10	4	DIODE, SCR 300V	04713	MCR649AP5	720301	1
	L2	1	CHOKE	52542	503100	503100	1
	L2	2	CHOKE	52542	503105	503105	1
	L2	3	CHOKE	52542	503110	503110	1
	L2	4	CHOKE	52542	503120	503120	1
	Q16	1	TRANSISTOR, SINPN	02735	2N3772	700402	1
	Q16	2	TRANSISTOR, SINPN	02735	2N6258	700088	1
	Q16	3	TRANSISTOR, SINPN	02735	2N3442	700085	1
	Q16	4	TRANSISTOR, SINPN 300V	16758	DTS411	700429	1
	R54	1-4	RESISTOR' CC 47 Ω 10%, 1/2W	01121	EB4705	101575	1
	R58	1	RESISTOR, WW .1 Ω 10%, 5W	12697	VC5E	640011	1
	R58	2	RESISTOR, WW .2 Ω 3%, 5W			630022	1
	R58	3	RESISTOR, WW .2 Ω 3%, 3W	15915	TS2D	640020	1
	R58	4	RESISTOR, WW 5 Ω 3+, 3W	15915	TS2D	640070	1
	R124	1-4	RESISTOR, CC 220 Ω 10%, 1/2W	01121	EB2215	101667	1
		1-4	SOCKET, Transistor	52542	830101	830101	1
		1-4	STANDOFF, #4	17117	2304-14-1	860020	3
		1-3	HEATSINK	52542	121762	121762	1
		4	HEATSINK	52542	T049380	T049380	1
		1-3	WASHER, Mica	52542	T018330	T018330	1
		4	WASHER, Mica	52542	T990307	T990307	4
		1-4	WASHER, Mica	08289	DM-111	103358	1
		1-4	WASHER, Mica	52542	T990295	T990295	2
		4	BRACKET	52542	060470	060470	1
			HEAT SINK ASSEMBLY #2				
		1	ASSEMBLY, Heat Sink	52542	PD25907	PD25907	1
		2	ASSEMBLY, Heat Sink	52542	PD25930	PD25930	1
		3	ASSEMBLY, Heat Sink	52542	PD25953	PD25953	1
		4	ASSEMBLY, Heat Sink	52542	PD25976	PD25976	1

Used On Code: 1 = RS20-20 BOV 2 = RS40-15 BOV 3 = RS60-12 BOV 4 = RS160-4 BOV

TITLE: RS SERIES SHIPPING ASSEMBLY (Cont'd)

ITEM	REF	USED ON	COMPONENT DESCRIPTION	MFR'S CODE	MANUFACTURER'S PART NUMBER	SD STOCK NUMBER	T/Q
	C46	1-4	CAPACITOR, .1 μF, 100V			800176	1
	CR9	1	DIODE, SCR 50V	03508	C228F	720008	1
	CR9	2,3	DIODE, SCR 200V	03508	C35B	720000	1
	CR9	4	DIODE, SCR 300V	04713	MCR649AP5	720301	1
	L1	1-4	CHOKE	52542	060358	060358	1
	Q15	1	TRANSISTOR, SINPN	02735	2N3772	700402	1
	Q15	2	TRANSISTOR, SINPN	02735	2N6258	700088	1
	Q15	3	TRANSISTOR, SINPN	02735	2N3442	700085	1
	Q15	4	TRANSISTOR, SINPN 300V	16758	DTS411	700429	1
	R70	1	RESISTOR, WW 0.1 Ω 10%, 5W	12697	VC5E	640011	1
	R70	2	RESISTOR, WW 2 Ω 1%, 5W			630022	1
	R70	3	RESISTOR, WW 0.2 Ω 3%, 3W	15915	TS2D	640020	1
	R70	4	RESISTOR, WW 0.5 Ω 3%, 3W	15915	TS2D	640070	1
	R125	1-4	RESISTOR, CC 220 Ω 10%, 1/2W	01121	EB2215	101667	1
		1-4	STANDOFF, #4	17117	2304-14-1	860020	2
		1-4	SOCKET, Transistor	52542	830101	830101	1
		1-4	WASHER, Mica	52542	T018330	T018330	1
		1-4	WASHER, Mica	08289	DM-111	103358	1
		1-4	WASHER, Mica			T990295	2
			HEAT SINK ASSEMBLY #3				
		1	ASSEMBLY, Heatsin	52542	PD25908	PD25908	1
		2	ASSEMBLY, Heat Sink	52542	PD25931	PD25931	1
		3	ASSEMBLY, Heat Sink	52542	PD25954	PD25954	1
		4	ASSEMBLY, Heat Sink	52542	PD25977	PD25977	1
	Q13,14	1	TRANSISTOR, SINPN	02735	2N3772	700402	2
	Q13,14	2	TRANSISTOR, SINPN	02735	2N6258	700088	2
	Q13,14	3	TRANSISTOR, SINPN	02735	2N3442	700085	2
	Q13,14	4	TRANSISTOR, SINPN 300V	16758	DTS411	700429	2
	R55,69	1	RESISTOR, WW 0.1 Ω 10%, 5W	12697	VC5E	640011	2
	R55,69	2	RESISTOR, WW 0.2 Ω 10%, 5W			630022	2
	R55,69	3	RESISTOR, WW 0.2 Ω 10%, 3W	15915	TS2D	640020	2
	R55,69	4	RESISTOR, WW 5 Ω 10%, 3W	15915	TS2D	640070	2
		1-4	SOCKET, Transistor	52542	830101	830101	2
		1-4	STANDOFF, #4	17117	2304-14-1	860020	4
		1-4	WASHER, Mica	08289	DM-111	103358	2
			PC BOARD ASSEMBLY				
		1,2	ASSEMBLY, PC Board	52542	PD25897	PD25897	1
		3	ASSEMBLY, PC Board	52542	PD25943	PD25943	1
		4	ASSEMBLY, PC Board	52542	PD25966	PD25966	1
		1-4	BOARD, PC	52542	121386	121386	1
	C2	1-3	CAPACITOR, Ceramic .0033 μF,600	71590	CE332	800025	1
	C2	4	CAPACITOR, Ceramic .01 μF,600V	71590	DP6-103	800090	2
	C3	1-4	CAPACITOR, Ceramic .001 μF,600V	91418	TYPE B	100076	1

Used On Code: 1 = RS20-20 BOV 2 = RS40-15 BOV 3 = RS60-12 BOV 4 = RS160-4 BOV

TITLE: RS SERIES SHIPPING ASSEMBLY (Cont'd)

ITEM	REF	USED ON	COMPONENT DESCRIPTION	MFR'S CODE	MANUFACTURER'S PART NUMBER	SD STOCK NUMBER	T/Q
	C4	1-3	CAPACITOR, Ceramic .01 μF,600V	71590	DD6-103	800090	1
	C4	4	Same as C2				
	C6	1-4	CAPACITOR, El Ax 34 μF, 20V	56289	40D3560025DC4	810060	1
	C13	1-4	CAPACITOR, MF .15 μF 10%, 250V	52763	MKT1813-415/25	800210	1
	C33	1-4	CAPACITOR, MF 0.1 μF 10%, 250V	52763	MKT1813-410/25	800185	1
	C34	1-4	CAPACITOR, Tant 68 μF, 6V	56289	196D686X0006KA1	821019	3
	C35	1-4	Same as C34				
	C36	1-4	CAPACITOR, 250 μF, 20V			810172	1
	C37	1-4	CAPACITOR, Ceramic .05 μF, 600V	72982	845-024	800168	1
	C38	1-4	CAPACITOR, 75 μF, 15V			810090	1
	C39	1-4	CAPACITOR, El Ax 10 μF, 50V	56289	TE1304	106445	1
	C40	1-4	Same as C34				
	C41	1-4	CAPACITOR, Tant .0022 μF, 200V			800020	1
	CR1-6,16-21,28-37,39,41,42,45,46	1-3	DIODE, Rectifier 400V	04713	1N5395	100413	22
	CR1-6,11,12,16-21,28-37,39,41,42,45,46	4	DIODE, Rectifier 400V	04713	1N5395	100413	24
	CR14	1-4	DIODE, Reference 6.2V	04713	1N823	720461	1
	CR15	1-4	DIODE, Reference 9.4V	04713	1N2163A	720262	1
	CR22,40	1-4	DIODE, Zener 12V	04713	1N759A	100390	2
	CR26	1-	DIODE, Rectifier 100V	04713	1N5401	710454	1
	CR38	1,2	DIODE, Zener 20V	04713	1N4747A	720419	1
	CR38,43	3,4	DIODE, Zener 20V	04713	1N4747A	720419	2
	CR44	4	DIODE, Zener 30V	04713	1N4751A	720425	1
	Q1,8-11	1-4	TRANSISTOR, SINPN	02735	2N2714	700180	5
	Q2-7,20,25	1-4	TRANSISTOR, SINPN	02735	2N2905A	705067	8
	Q12	1-4	TRANSISTOR, Selected	52542	720145	720145	1
	Q18,19	1,2	TRANSISTOR, SINPN	07263	2N2219A	106587	2
	Q18,19	3	TRANSISTOR, SINPN	07263	2N5321	705075	2
	Q18,19	4	TRANSISTOR, SINPN	02735	2N3440	101420	2
	Q24,26,27	1-4	TRANSISTOR, SINPN	02735	2N3566	700182	3
	R2	1-4	RESISTOR, MF 10 k 2%, 1/2W	81349	RN65D1001F	620608	1
	R3	1-4	RESISTOR, MF 274 Ω 1%, 1/2W	81349	RN65D2740F	620095	1
	R4	1-4	RESISTOR, CC 47 k 10%, 1/2W	01121	EB2725	101437	2
	R5	1-3	RESISTOR, MF 1.18 k 1%, 1/2W	81349	RN65D1181F	620320	2
	R5	4	RESISTOR, MF 1.18 k 1%, 1/2W	81349	RN65D1181F	620320	1
	R6	1-4	RESISTOR, Variable 200 Ω 20%,1/2W	80294	3386P-1-201	600115	2
	R7	1-4	RESISTOR, MF 442 Ω 1%, 1/2W	81349	RN65D4420F	620155	2
	R8	1-4	RESISTOR, MF 374 Ω 1%, 1/2W	81349	RN65D3740F	620135	1

Used On Code: 1 = RS20-20 BOV 2 = RS40-15 BOV 3 = RS60-12 BOV 4 = RS160-4 BOV

TITLE RS SERIES SHIPPING ASSEMBLY (Cont'd)

ITEM	REF	USED ON	COMPONENT DESCRIPTION	MFR'S CODE	MANUFACTURER'S PART NUMBER	SD STOCK NUMBER	T/Q
	R9	1-4	Same as R7				
	R10	1-4	RESISTOR, MF 604 Ω 1%, 1/2W	81349	RN65D6040F	620210	1
	R11	1-4	RESISTOR, Var 2 k 20%, 1/2W	80294	3380P1203	600207	1
	R15	1-4	RESISTOR, MF 511 Ω 1%, 1/2W	81349	RN65D5110F	620180	2
	R16	1-4	RESISTOR, MF 750 Ω 1%, 1/2W	81349	RN65D7500F	620250	3
	R17	1-4	RESISTOR, CC 27 k 5%, 1/2W	01121	EB2735	101517	1
	R18	1-4	RESISTOR, MF 1 k 1%, 1/2W	81349	RN65D1001F	620300	2
	R19	1,2,4	RESISTOR, CC 100 Ω 10%, 1/2W	01121	EB1015	101498	6
	R19	3	RESISTOR, CC 100 Ω 10%, 1/2W	01121	EB1015	101498	7
	R20	1-4	RESISTOR, CC 1 k 10%, 1/2W	01121	EB1025	101467	5
	R21	1-4	RESISTOR, CC 100 k 10%, 1/2W	01121	EB1045	101480	2
	R22	1,3	RESISTOR, CC 470 Ω 5%, 1/2W	01121	EB4715	101539	1
	R22	2,4	Same as R19				
	R23	1-4	Same as R15				
	R24	1-4	RESISTOR, MF 1.5 k 1%, 1/2W	81349	RN65D1501F	620360	2
	R25	1-4	RESISTOR, MF 1.24 k 1%, 1/2W	81349	RN65D1241F	620340	1
	R26	1-4	Same as R16				
	R27	1-4	Same as R16				
	R28	1-4	Same as R19				
	R29	1-4	RESISTOR, MF 3.01 k 1%, 1/2W	81349	RN65D3011F	620480	2
	R30	1-4	Same as R29				
	R31	1	RESISTOR, MF 523 Ω 1%, 1/2W	81349	RN65D5620F	620193	1
	R31	2	RESISTOR, MF 681 Ω 1%, 1/2W	81349	RN65D6810F	620220	1
	R31	3	RESISTOR, MF 422 Ω 1%, 1/2W	81349	RN65D4220F	620145	1
	R31	4	RESISTOR, MF 1.74 k 1%, 1/2W	81349	RN65D1741F	620384	1
	R32	1	RESISTOR, MF 200 Ω 1%, 1/2W	81349	RN65D2000F	620070	1
	R32	2	RESISTOR, MF 287 Ω 1%, 1/2W	81349	RN65D2870F	620101	1
	R32	3	RESISTOR, MF 150 Ω 1%, 1/2W	81349	RN65D1500F	102062	1
	R32	4	RESISTOR, MF 806 Ω 1%, 1/2W	81349	RN65D8060F	620262	1
	R33	1-4	RESISTOR, WW 85 Ω 3%, 3W	15915	TS2C	630240	1
	R34	1-4	RESISTOR, WW 680 Ω 10%, 2W	75042	BWH	640490	1
	R35	1-4	Same as R19				
	R37	1-4	Same as R19				
	R38	4	RESISTOR, WW 10 Ω 3+, 3W	15915	TS2C	630150	1
	R41	1-4	RESISTOR, MF 52.3 k 1%, 1/2W	81349	RN65D5232F	620728	1
	R42	1-4	RESISTOR, CC 15 k 10%, 1/2W	01121	EB1535	101500	1
	R46	1-4	RESISTOR, MF 3.48 k 1%, 1/2W	81349	RN65D3481F	620489	1
	R47	1-4	Same as R18				
	R61	1-4	Same as R20				
	R62	1-4	Same as R20				
	R63	1-4	RESISTOR, Var 100 Ω 20%, 1/2W	80294	3389P-1-101	600046	1
	R64	1	RESISTOR, Shunt 20A	52542	125572	125572	1
	R64	2,3	RESISTOR, Shunt 15A	52542	068761	068761	1
	R64	4	RESISTOR, Shunt 5A	52542	068764	068764	1
	R67	1-3	Same as R6				
	R67	4	RESISTOR, Var 500 Ω 10%, 1/2W	73138	72PR500	600133	1

Used On Code: 1 = RS20-20 BOV 2 = RS40-15 BOV 3 = RS60-12 BOV 4 = RS160-4 BOV

TITLE			RS SERIES SHIPPING ASSEMBLY (Cont'd)				
ITEM	REF	USED ON	COMPONENT DESCRIPTION	MFR'S CODE	MANUFACTURER'S PART NUMBER	SD STOCK NUMBER	T/Q
	R67	4	RESISTOR, Var 500 Ω 10%, 1/2W	73138	72PR500	600133	1
	R77	1-4	RESISTOR, CC 150 Ω 10%, 1/2W	01121	EB1515	101527	1
	R79	1-4	RESISTOR, CC 22 Ω 10%, 1/2W	01121	EB2215	101667	1
	R93	1-4	RESISTOR, CC 47 Ω 10%, 1/2W	01121	EB4705	101575	1
	R94	1,2,4	RESISTOR, CC 10 k 10%, 1/2W	01121	EB1035	101471	1
	R94	3	RESISTOR, CC 10 k 10%, 1/2W	01121	EB1035	101471	2
	R95	1,3,4	RESISTOR, MF 36.5 k 1%, 1/2W	81349	RN65D3652F	620687	3
	R95	2	RESISTOR, MF 36.5 k 1%, 1/2W	81349	RN65D3652F	620687	4
	R96	1-4	Same as R95				
	R97	1-4	RESISTOR, CC 1.5 k 10%, 1/2W	01121	EB1525	101459	1
	R98	1-4	RESISTOR, MF 2.67 Ω 10%, 1/2W	81349	RN65D2671D	620463	1
	R99	1-4	Same as R95				
	R100	1-4	Same as R24				
	R101	1	RESISTOR, MF 53.6 k 1%, 1/2W	81349	RN65D5362F	620729	1
	R101	2	RESISTOR, MF 45.6 k 1%, 1/2W	81349	RN65D4532F	620704	1
	R101	3	RESISTOR, MF 45.6 k 1%, 1/2W	81349	RN65D4532F	620704	2
	R101	4	RESISTOR, MF 100 k 1%, 1/2W	91637	MFF 1/4 T1	102206	1
	R104	1	RESISTOR, MF 13 k 1%, 1/2W	81349	RN65D1302F	620623	1
	R104	2	Same as R95				
	R104	3	Same as R101				
	R104	4	Same as R41				
	R110	1-4	RESISTOR, CC 4.7 k 10%, 1/2W	01121	EB4725	101511	1
	R111	1-4	Same as R4				
	R112	1-4	Same as R19				
	R113	1-4	RESISTOR, CC 820 Ω 10%, 1/2W	01121	EB8215	101656	1
	R114	1-4	Same as R20				
	R115	1-4	Same as R20				
	R116	1-3	Same as R19				
	R116	4	RESISTOR, CC 3.3 k 10%, 1/2W	01121	EB3325	101432	1
	R117	4	RESISTOR, CC 680 k 10%, 1/2W	01121	EB6845	101504	1
	R118	3	Same as R94				
	R118	4	RESISTOR, CC 33 k 10%, 1/2W	01121	EB3335	101456	1
	R119	1-4	Same as R21				
	R123	1-4	RESISTOR, CC 22 k 10%, 1/2W	01121	EB2235	101513	1
	R126	1-4	RESISTOR, CC 2.2 Ω 10%, 1/2W	01121	EB2205	106012	1
			OVERVOLTAGE PC ASSEMBLY				
		1	ASSEMBLY, OV PC	52542	PD26261	PD26261	1
		2	ASSEMBLY, OV PC	52542	PD26263	PD26263	1
		3	ASSEMBLY, OV PC	52542	PD26265	PD26265	1
		4	ASSEMBLY, OV PC	52542	PD26267	PD26267	1
		1-4	BOARD, PC	52542	122426	122426	1
	C114	1-4	CAPACITOR, MF .15 μF, 250V	52763	MKT1813-415/25	800210	1
	CR134	1	DIODE, SCR 100V	04713	MCR649AP-3	720290	1
	CR134	2,3	DIODE, SCR 200V	04713	MCR649AP-4	720300	1
	CR134	4	DIODE, SCR 300V	04713	MCR649AP-5	720301	1

Used On Code: 1 = RS20-20 BOV 2 = RS40-15 BOV 3 = RS60-12 BOV 4 = RS160-4 BOV

TITLE RS SERIES SHIPPING ASSEMBLY (Cont'd)

ITEM	REF	USED ON	COMPONENT DESCRIPTION	MFR'S CODE	MANUFACTURER'S PART NUMBER	SD STOCK NUMBER	T/Q
	CR135,38 39	1-4	DIODE, Rectifier 400V	04713	1N5395	100413	3
	CR137	1-3	DIODE, Rectifier 100V	81483	70H10A	720330	1
	CR137	4	DIODE	04713	1N2138/60HF60	720448	1
	F2	1	FUSE, 30A 25V	52542	870232	870232	1
	F2	2,3	FUSE, 20A 250V	52542	870222	870222	1
	F2	4	FUSE, 7A 250V	52542	870194	870194	1
	Q121	1-3	TRANSISTOR, SIPNP 60V	04713	2N2905A	705067	1
	Q121	4	TRANSISTOR	04713	MPS-A92	700179	1
	R181	1-4	RESISTOR, MF 12.4 k 1%, 1/4W	91637	MFF 1/4 T1	102201	1
	R182	1-4	RESISTOR, WW 700 Ω 3%, 3W	15915	TS2C	630370	1
	R183,84	1-4	RESISTOR, CC 1.5 k 10%, 1/2W	01121	EB1525	101459	2
	R186	4	RESISTOR, CC 1 k 10%, 1/2W	01121	EB1025	101467	2
	R187	1-3	RESISTOR, CC 1 k 10%, 1/2W	01121	EB1025	101467	1
	R187	4	Same as R186				
	R188	3	RESISTOR, WW .3 Ω 3%, 5W			630027	1
		1-4	CLIP, Fuse	71400	5678-14	106908	2
		1-4	HEATSINK, W/Bracket	13103	6103B Base	103856	1
		1-4	PAD, Transistor	52542	840420	840420	2
		1	HARNESS, AC	52542	PD2589801	PD2589801	1
		2,3	HARNESS, AC	52542	PD2592101	PD2592101	1
		4	HARNESS, AC	52542	PD2596701	PD2596701	1
		1	HARNESS, DC	52542	PD2589901	PD2589901	1
		2,3	HARNESS, DC	52542	PD2592201	PD2592201	1
		4	HARNESS, DC	52542	PD2596901	PD2596901	1

Used On Code: 1 = RS20-20 BOV 2 = RS40-15 BOV 3 = RS60-12 BOV 4 = RS160-4 BOV

TITLE MODEL RS320-2C SHIPPING ASSEMBLY #T065600 Rev C

ITEM	REF	USED ON	COMPONENT DESCRIPTION	MFR'S CODE	MANUFACTURER'S PART NUMBER	SD STOCK NUMBER	T/Q
			ASSEMBLY, Front Panel	52542	PD25788	PD25788	1
			PANEL, Front	52542	121114	121114	1
	DS1		LIGHT, Pilot	91802	1040D32	770020	1
	DS2		LIGHT, Pilot	91802	2190A87	770023	1
	J1		BINDING POST, Red	58474	DF31RC	T920220	1
	J2		BINDING POST, Black	58474	DF31BC	T920180	1
	J3		BINDING POST, White	74970	DF31WTC	T920210	1
	M1		ASSEMBLY, Meter 0-2A	52542	06507501	06507501	1
	M2		ASSEMBLY, Meter 320V	52542	06504202	06504202	1
	R56		RESISTOR, Variable 100 k 5%, 2W	80294	3540 S-2-104	600455	1
	R77		RESISTOR, Variable 100 Ω 5%, 2W	80294	35405-1-101	600043	1
	R401		RESISTOR, Variable 20 k	73138	72XL R20K	117125	1
	R402		RESISTOR, MF 309 k	91637	CMF-60 T1	117128	1
	S1		SWITCH	52542	880030	880030	1
			NUT, Hex	73734	9006	103862	2
			ASSEMBLY, Shunt Board	52542	PD25789	PD25789	1
	C30		CAPACITOR, Ceramic .22 μF,400V	52542	800254	800254	1
	R90		RESISTOR, Variable 50 Ω 20%,1/2W	73138	62PR50	101906	1
	R91		RESISTOR, WW .05 Ω 3%, 5W	15915	TSK5 .05 3%	117464	1
			KNOB	52542	T920073	T920073	2
			LUG, Solder	79963	681-264	T960140	4
			ASSEMBLY, Chassis	52542	PD26408	PD26408	1
	T1		TRANSFORMER	52542	PD26408	PD26408	1
	T2		TRANSFORMER	52542	505578	505578	1
			BRACKET, Transformer	52542	T04640002	T04640002	4
			BRACKET, Resistor Mtg.	52542	076358	076358	2
			BRACKET, Cover Support	52542	122642	122642	1
			BRACKET, Cap	52542	076368	076368	2
			BRACKET, Cap	56289	CM5-22	100725	2
			BRACKET, Cap	52542	T046598	T046598	2
			ASSEMBLY, Diode Mtg. Bracket	52542	PD25779	PD25779	1
	C1		CAPACITOR, El Can 950 μF,50V	52542	820051	820051	1
	C14		CAPACITOR, El Can 750 μF,350V	52542	820036	820036	1
	C22		CAPACITOR, El Can 2200 μF,400V	52542	820138	820138	1
	C23		CAPACITOR, El Ax .47 μF, 400V	52542	800295	800295	1
	C29		CAPACITOR, El Can 90 μF, 400V	52542	820027	820027	1
	CR3		DIODE, Zener 24V	04713	1N1360A	720241	1
	CR32		DIODE, Rectifier 600V	04713	1N3622	720137	1
	R1		RESISTOR, WW 150 Ω, 25W	19701	FR25	650570	1
	R59		RESISTOR, WW 5 k, 50W	12697	VP5K	650804	1
	R76		RESISTOR, WW 0.5 Ω, 25W	19701	FR5	650081	1
	R82		RESISTOR, WW 15 k, 50W	12697	VP50K	650818	1

TITLE			MODEL RS320-2C SHIPPING ASSEMBLY #T065600 (Cont'd)				
ITEM	REF	USED ON	COMPONENT DESCRIPTION	MFR'S CODE	MANUFACTURER'S PART NUMBER	SD STOCK NUMBER	T/Q
			COVER	52542	076268	076268	1
			FEET, Rubber	52542	040192	040192	4
			BRACKET	52542	T900130	T900130	2
			HARNESS, AC	52542	PD2578201	PD2578201	1
			HARNESS, DC	52542	PD2578401	PD2578401	1
			HANDLE	52542	T920040	T920040	2
			ASSEMBLY, Rear Panel	52542	PD25787	PD25787	1
	C20		CAPACITOR, MF .22 μF, 400V	52542	800254	800254	1
	L1,2		CHOKE	52542	503001	503001	1
			RECEPTACLE, AC	82389	EAC-301	101288	1
			HOLDER, Fuse	75915	345001	117377	1
			FUSE, 15A 250V	52542	870212	870212	1
			LINE CORD	70903	17502	117680	1
			BLOCK, Output	52542	076468	076468	1
			COVER, DC	52542	077058	077058	1
			STANDOFF, DC Cover	52542	860130	860130	2
			STRIP, Barrier	52542	851107	851107	1
			BARRIER, Cover	52542	077048	077048	1
			STANDOFF, Barrier Cover	06540	9739-S-0632-3A	860100	2
			ROD, Threaded	52542	T971005	T971005	4
			LINK, Shorting	52542	T012240	T012240	2
			LINK, Shorting	52542	840216	840216	2
			LINK, Shorting	52542	840217	840217	3
			ASSEMBLY, Heat Sink #1	52542	07631801	07631801	1
	CR25		DIODE, Rectifier 600V	04713	1N3622	720137	2
	CR26		Same as CR25				
	CR27		DIODE, SCR 400V	02735	2N3670	725130	2
	CR28		Same as CR27				
			SOCKET	22753	DTS-2	830101	2
			HEATSINK	52542	076318	076318	1
			ASSEMBLY, Heat Sink #2	52542	07632801	07632801	1
	Q16		TRANSISTOR, SINPN 400V	16758	DTS 423	106607	1
	R66		RESISTOR, WW 0.7 Ω 3%, 3W	15915	TS-2C	630020	1
			SOCKET	22753	PTS-2	830101	1
			STANDOFF	17117	2304-14-1	860020	1
			HEATSINK	52542	076328	076328	1
			ASSEMBLY, Heat Sink #3	52542	07633801	07633801	1
	Q15		TRANSISTOR, SINPN 400V	16750	DTS 423	106607	1
	Q18		TRANSISTOR		TR1591	700191	1
	R65		RESISTOR, WW 0.7 Ω 3%, 3W	15915	TS-2C	630020	1
			HEATSINK	52542	076338	076338	1
			SOCKET, Transistor	22753	PTS-2	830101	1
			SOCKET, Transistor	04713	MK-25	100937	1

TITLE MODEL RS320-2C SHIPPING ASSEMBLY #T065600 (Cont'd)

ITEM	REF	USED ON	COMPONENT DESCRIPTION	MFR'S CODE	MANUFACTURER'S PART NUMBER	SD STOCK NUMBER	T/Q
			ASSEMBLY, Comp Board #1	52542	PD25771	PD25771	1
			BOARD, PC	52542	076438	076438	1
	C2		CAPACITOR, MF .047 μF 10%, 250V	52763	MKT1813-447/25	800147	1
	C4		CAPACITOR, Ceramic .0033 μF,600	71590	CE-332	800025	1
	C5		CAPACITOR, Ceramic .001 μF,200V	91418	TYPE B	100076	1
	C6		CAPACITOR, Ceramic .01 μF,100V	71590	DD6-103	800090	1
	C7		CAPACITOR, MF 0.1 μF, 250V	52763	MKT1813-410/25	800185	2
	C8		CAPACITOR, El Ax 10 μF, 50V	56289	TE1304	106445	1
	C9		CAPACITOR El Ax 75 μF, 15V			810090	1
	C10		Same as C7				
	C17		CAPACITOR, MF .047 μF 10%,400V	52763	MKT1813-347/40	800155	1
	C24		CAPACITOR, Ceramic .0047 μF,1 kV	71590	DD-472	800050	2
	C31		Same as C24				
	CR4		DIODE, Zener 5.1V	03877	1N751A	100378	1
	CR5-8, 15		DIODE, Rectifier 400V	04713	1N5395	100413	
	CR16		DIODE, Reference 9.4V	12954	1N2164A	720397	1
	CR17		DIODE, Zener 13V	04713	1N964B	100412	1
	CR18-20		Same as CR5				
	CR23,24 30		Same as CR5				
	CR31		DIODE, Zener 5.1V	04713	1N4733A	720388	1
	CR33		DIODE, Rectifier 100V	04713	1N5401	710454	1
	CR42		Same as CR5				
	Q1		TRANSISTOR, SIPNP 150V	04713	2N3440	101420	1
	Q2		TRANSISTOR, SIPNP 150V	04713	MM4001	705066	1
	Q3-5		TRANSISTOR, SINPN	04713	2N2714	700180	8
	Q6		TRANSISTOR, SIPNP 60V	04713	2N2905A	705067	3
	Q7-10		Same as Q3				
	Q11		TRANSISTOR, SINPN	04713	2N4238	700047	1
	Q12		Same as Q6				
	Q13		TRANSISTOR, Selected	52542	720145	720145	1
	Q14		Same as Q6				
	Q20		TRANSISTOR, SINPN	02763	2N2219A-Spec	106587	1
	Q21		Same as Q10				
	R2		RESISTOR, MF 10 k 2%, 1/2W	81349	RN65D1001F	620608	1
	R3		RESISTOR, MF 49.92 k 1%, 1/2W	81349	RN65D4992F	620710	1
	R4		RESISTOR, MF 1.18 k 1%, 1/2W	81349	RN65D1181F	620320	1
	R5		RESISTOR, MF 170 Ω 3%, 3W	81349	RN65D1701F	630261	1
	R6		RESISTOR, MF 1.96 k 1%, 1/2W	81349	RN65D1961F	620402	7
	R7		Same as R6				
	R8		RESISTOR, CC	01121	EB1015	101498	2
	R9		RESISTOR, MF 750 Ω 1%, 1/2W	81349	RN65D7500F	620250	3
	R10		Same as R6				
	R11		RESISTOR, CC 470 Ω 5%, 1/2W	01121	EB4715	101539	1

TITLE	MODEL RS320-2C SHIPPING ASSEMBLY #T065600 (Cont'd)						
ITEM	REF	USED ON	COMPONENT DESCRIPTION	MFR'S CODE	MANUFACTURER'S PART NUMBER	SD STOCK NUMBER	T/Q
	R12		RESISTOR, CC 4.7 k 5%, 1/2W	01121	EB4725	101511	1
	R13		RESISTOR, CC 330 Ω 5%, 1/2W	01121	EB3315	101474	2
	R15		RESISTOR, MF 75 k 1%, 1/2W	81349	RN65D7500F	620754	1
	R16		RESISTOR, CC 560 Ω 1%, 1/2W	01121	EB5615	101631	1
	R17		RESISTOR, MF 402 Ω 1%, 1/2W	81349	RN65D4020F	620140	1
	R18		RESISTOR, WW 1.5 k 3+, 1W	15915	TS2C	630418	1
	R19		Same as R9				
	R20		Same as R6				
	R21		Same as R6				
	R22		RESISTOR, MF 1.74 k 1%, 1/2W	81349	RN65D1741F	620384	1
	R23		Same as R9				
	R24		RESISTOR, Variable 500 Ω, 1.5W	11236	1377438	600146	2
	R26		RESISTOR, WW 50 Ω 3%, 3W	15915	TS2C	630375	2
	R27		Same as R24				
	R28		Same as R8				
	R32		RESISTOR, WW 3 k 3%, 3W	15915	TS2C	630460	2
	R33		RESISTOR, WW 1 k 10%, 2W	75042	BWH	640500	1
	R34		Same as R32				
	R35		RESISTOR, WW 82 Ω, 2W	75042	BWH	640325	1
	R36		RESISTOR, CC 150 Ω, 1/2W	01121	EB1515	101527	2
	R38		RESISTOR, CC 2.2 k 5%, 1/2W	01121	EB2225	101454	3
	R39		RESISTOR, MF 681 Ω 1%, 1/2W	81349	RN65D6810F	620220	1
	R40		RESISTOR, MF 2.95 k 1%, 1/2W	81349	RN65D2951D	620467	1
	R41		Same as R13				
	R42		RESISTOR, Variable 25 k	52542	600364	600364	2
	R43		RESISTOR, MF 4.99 k 1%, 1/2W	81349	RN65D4991F	620580	3
	R44		Same as R42				
	R45		Same as R43				
	R46		Same as R43				
	R47		RESISTOR, CC 1 M 5%, 1/2W	01121	EB1055	101441	1
	R54		RESISTOR, CC 15 k 5%, 1/2W	01121	EB1535	101500	1
	R57		RESISTOR, CC 47 Ω 5%, 1/2W	01121	EB4705	101575	2
	R58		Same as R57				
	R61		RESISTOR, CC 1 k 5%, 1/2W	01121	EB1025	101467	3
	R62		RESISTOR, WW 5 k 5%, 5W	83777	VL5 5.0k 5%	640551	1
	R63		Same as R61				
	R64		RESISTOR, WW 4 k, 5W	52542	640549	640549	1
	R67		Same as R61				
	R68		Same as R38				
	R70		RESISTOR, MF 100 Ω 1%, 1/2W	81349	RN65D1000F	102063	1
	R71		RESISTOR, MF 274 Ω 1%, 1/2W	81349	RN65D2740F	620095	1
	R72		RESISTOR, Variable 150 Ω 10%,1/2	52542	600071	600071	1
	R73		Same as R6				
	R74		Same as R6				
	R75		RESISTOR, MF 604 Ω 1%, 1/2W	81349	RN65D6040F	620210	1

TITLE: MODEL RS320-2C SHIPPING ASSEMBLY #T065600 (Cont'd)

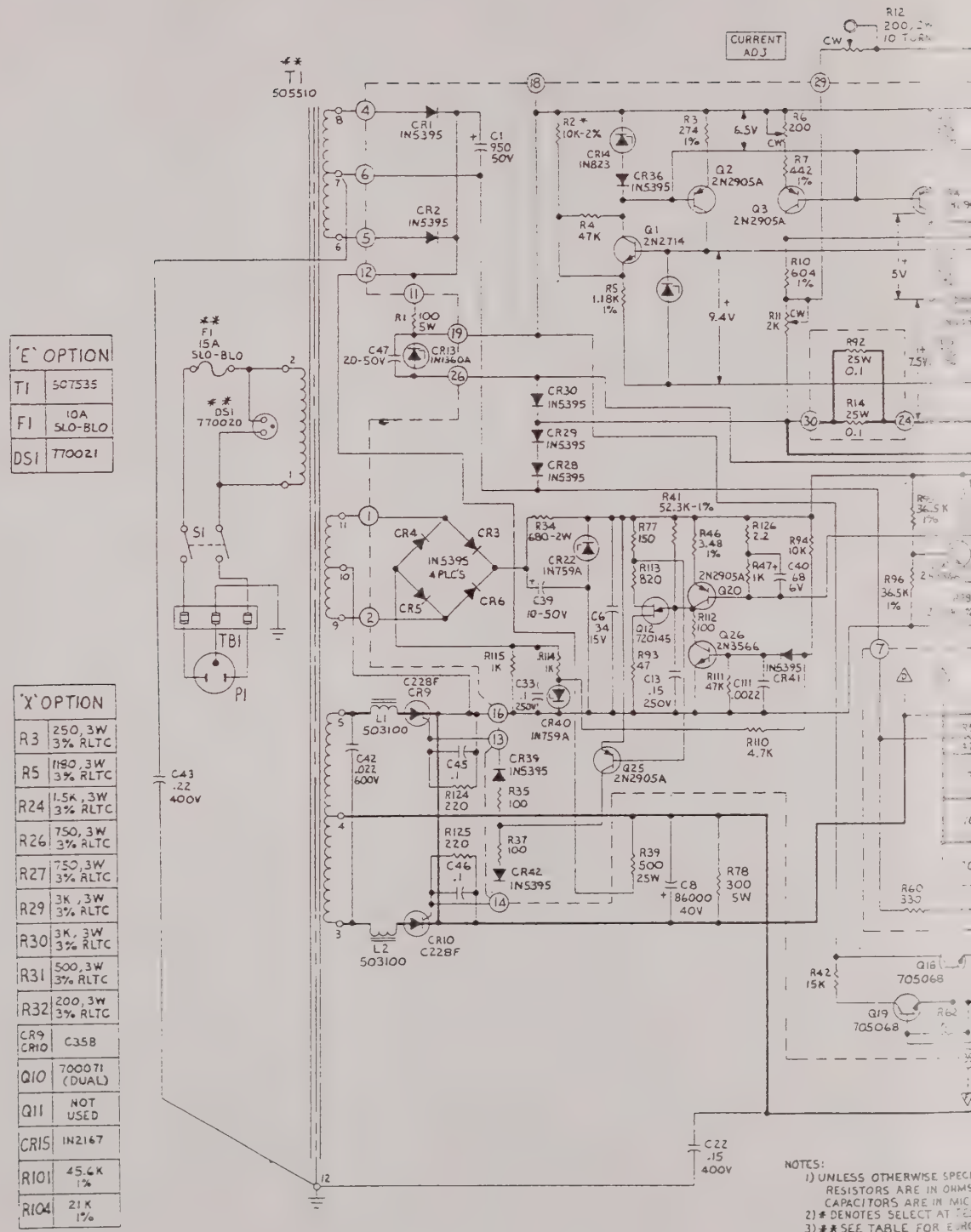
ITEM	REF	USED ON	COMPONENT DESCRIPTION	MFR'S CODE	MANUFACTURER'S PART NUMBER	SD STOCK NUMBER	T/Q
	R79		RESISTOR, MF 301 Ω 1%, 1/2W	19701	MF6C-D-3010F	102191	1
	R80		RESISTOR, Variable 2 k 10%,1½W	52542	600204	600204	1
	R84		Same as R26				
	R85		Same as R38				
			EYELET	52542	T960650	T960650	63
			ASSEMBLY, Comp Board #2	52542	PD25774	PD25774	1
			BOARD, PC	52542	076448	076448	1
	C27		CAPACITOR, 210 μF, 25V			810161	1
	CR9-14, 36-41		DIODE, Rectifier 400V	04713	1N5395	100413	12
	R29		RESISTOR, Variable 210 μF, 25V			810161	1
	R30		RESISTOR, CC 4.7 M 10%, 1/2W	01121	EB4751	611135	1
	R31		RESISTOR, CC 330 k 10%, 1/2W	01121	EB3345	101457	1
			EYELET	52542	T960650	T960650	17
			BRACKET, Mtg.	52542	T028728	T028728	2
			ASSEMBLY, Comp Board #3	52542	PD25776	PD25776	1
			BOARD, PC	52542	076458	076458	1
	C11		CAPACITOR, Ceramic .22 μF, 400V	52542	800254	800254	1
	C12		CAPACITOR, El Ax .47 μF, 400V	52542	800295	800295	1
	C13		CAPACITOR, El Ax 35 μF, 25V	56289	40D356G0250C4	810060	1
	C32		CAPACITOR, MF 0.1 μF 10%, 250V	52763	MKT1813-410/25	800185	1
	CR1		DIODE, Rectifier 400V	04713	1N5395	100413	4
	CR2		Same as CR1				
	CR21		Same as CR1				
	CR22		Same as CR1				
	CR29		DIODE, Zener 20V	04713	1N968	100409	1
	R48		RESISTOR, MF 100 k 1%, 1/2W	91637	MFF 1/4 T1	102206	2
	R49		Same as R48				
	R50		RESISTOR, MF 30.1 k 1%, 1/4W	81349	RN65D3012F	620677	1
	R51		RESISTOR, CC 100 Ω 10%, 1/2W	01121	EB1015	101498	2
	R52		RESISTOR, WW 30 k, 5W	52542	640650	640650	1
	R53		Same as R51				
	R92		RESISTOR, CC 22 Ω 10%, 1/2W	01121	EB2205	106011	1
			SPACER, Hex	52542	860110	860110	4
			TERMINAL	17117	2304-14-1	860020	1
			LABEL, Serial No.	52542	T101040	T101040	1
			LABEL, Rating	52542	781157	781157	1

CHAPTER 7

DRAWINGS

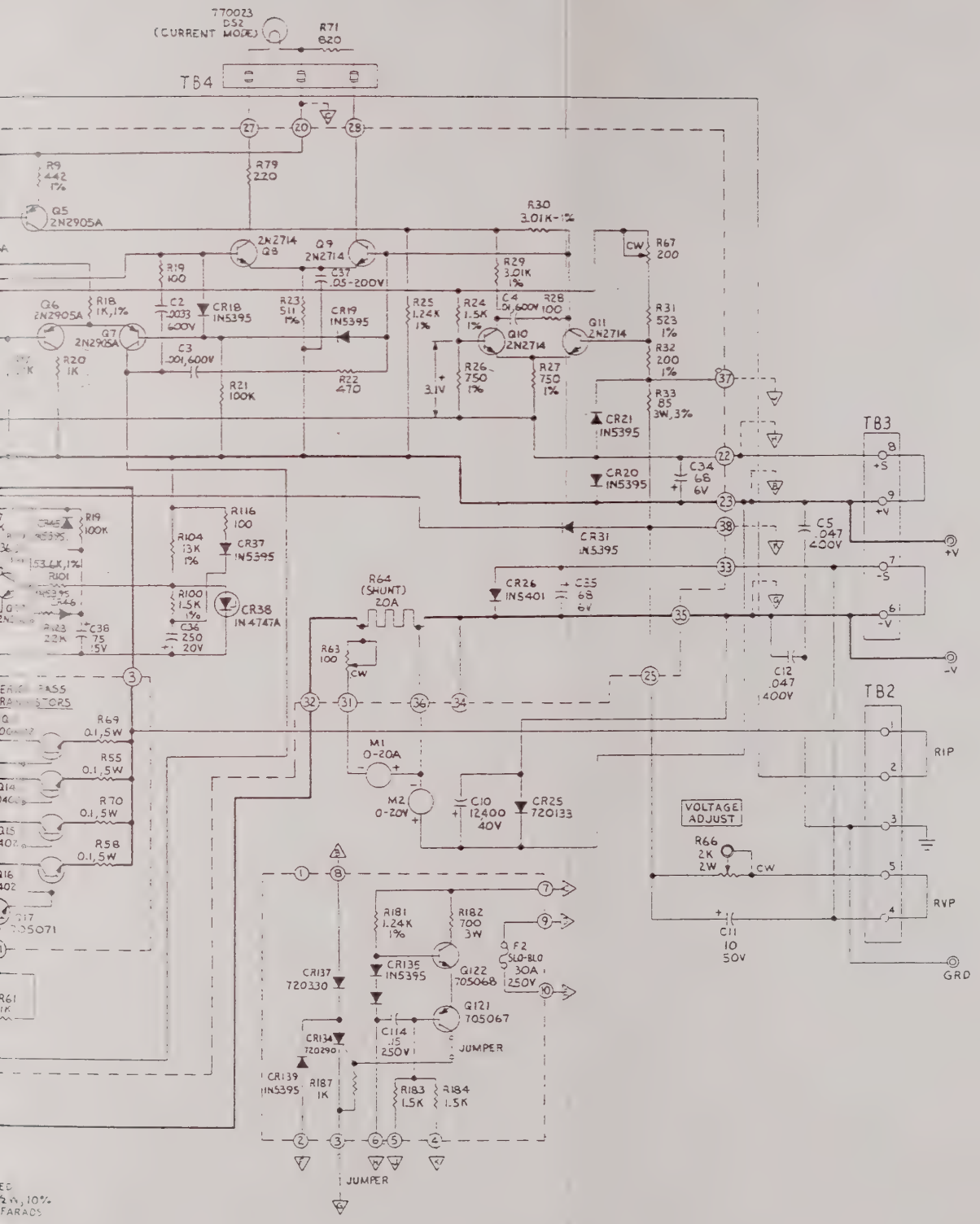
7.1 INTRODUCTION

This chapter contains the schematic drawings for the RS Series Constant Voltage/Constant Current Power Supplies. The schematic diagrams relate to the circuit details described throughout this manual. The parts list contained in Chapter 6 relate to the reference designation and item callouts on the diagrams.



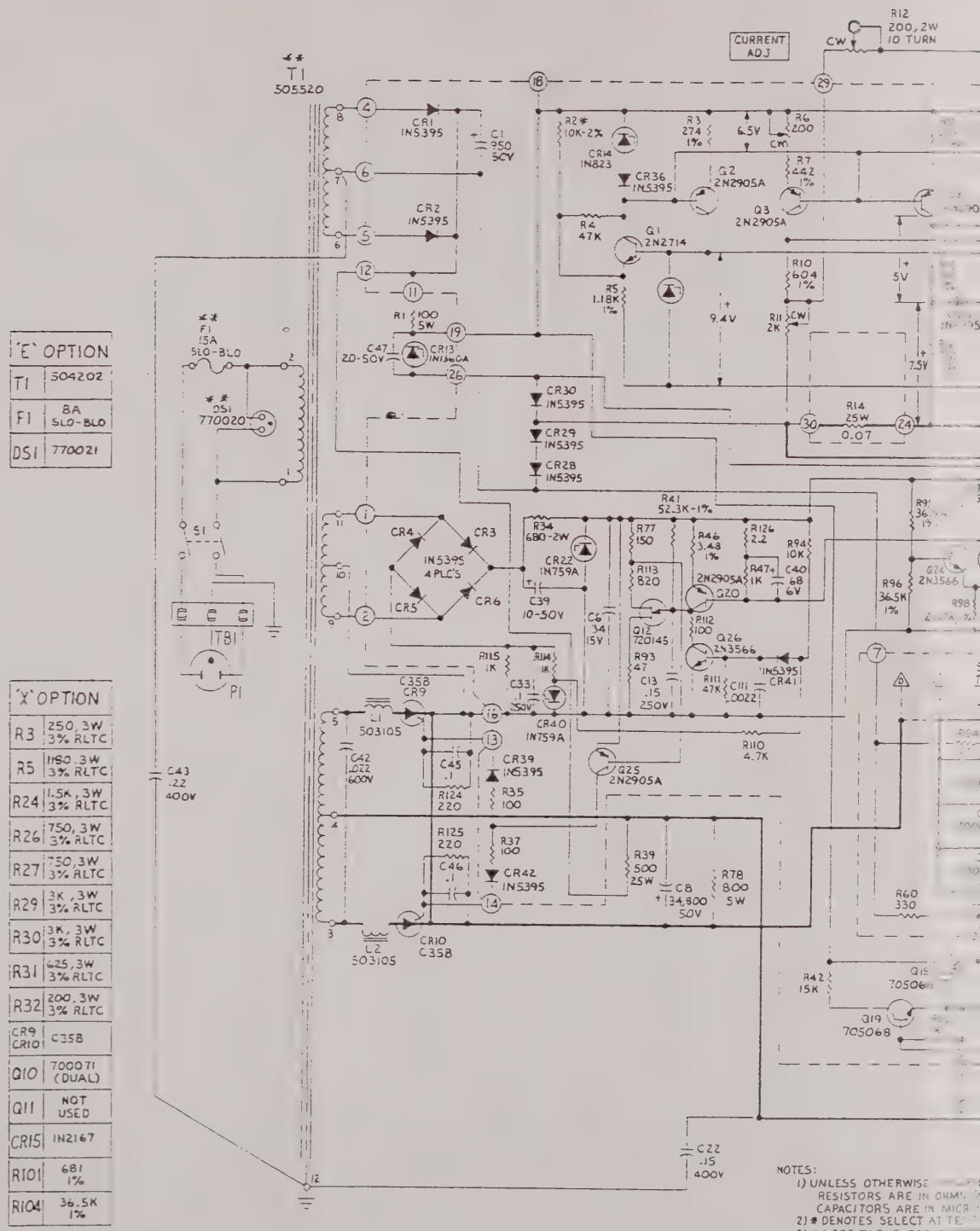
'E' OPTION	
T1	507535
F1	10A SLO-BLO
DS1	770021

'X' OPTION	
R3	250, 3W 3% RLTC
R5	1180, 3W 3% RLTC
R24	1.5K, 3W 3% RLTC
R26	750, 3W 3% RLTC
R27	750, 3W 3% RLTC
R29	3K, 3W 3% RLTC
R30	3K, 3W 3% RLTC
R31	500, 3W 3% RLTC
R32	200, 3W 3% RLTC
CR9 CR10	C35B
Q10	700071 (DUAL)
Q11	NOT USED
CR15	IN2167
R101	45.6K 1%
R104	21K 1%



MODEL RS20-20 BOV

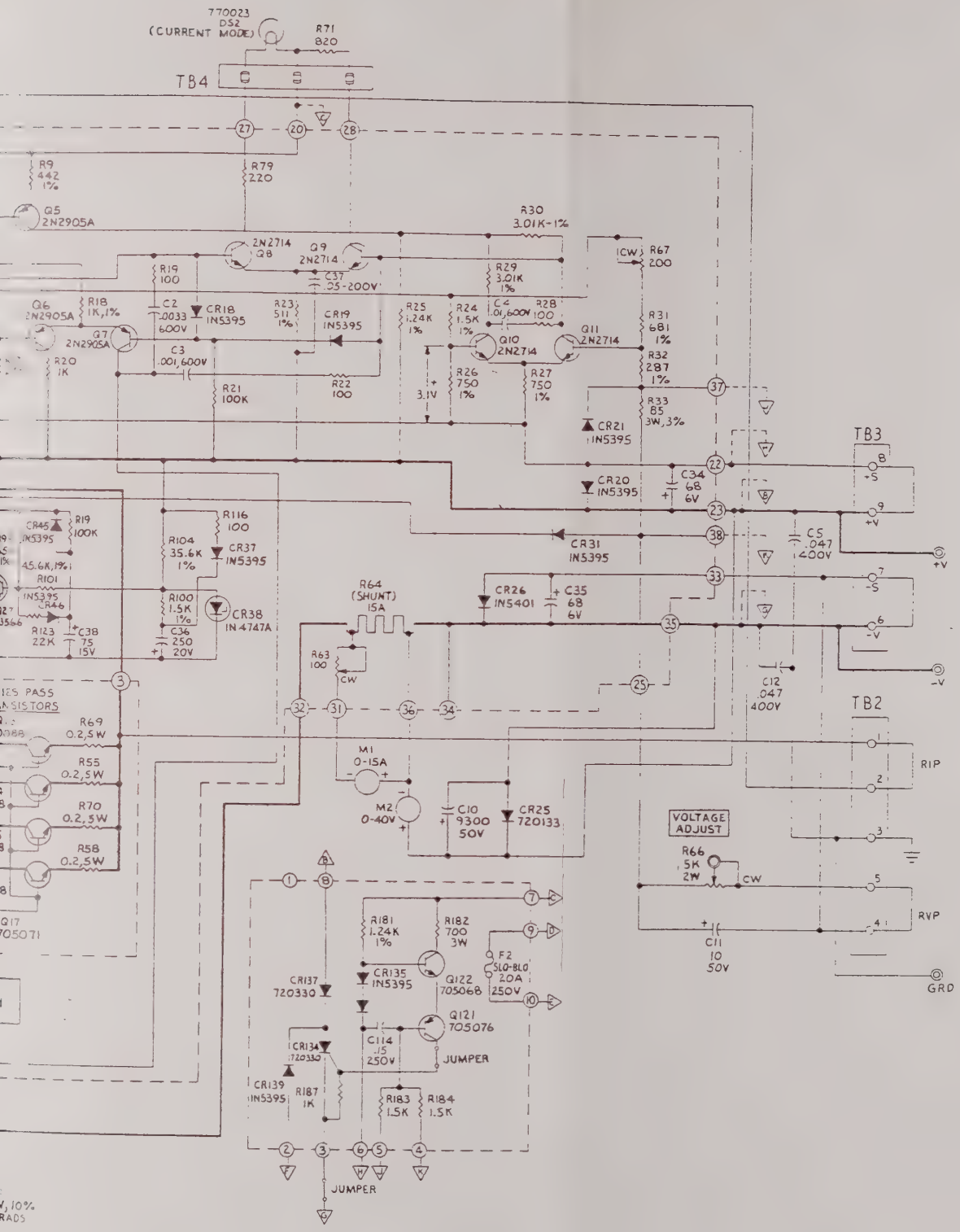
SCHEMATIC #12142001 Rev P



'E' OPTION	
T1	504202
F1	8A SLO-BLO
DS1	770021

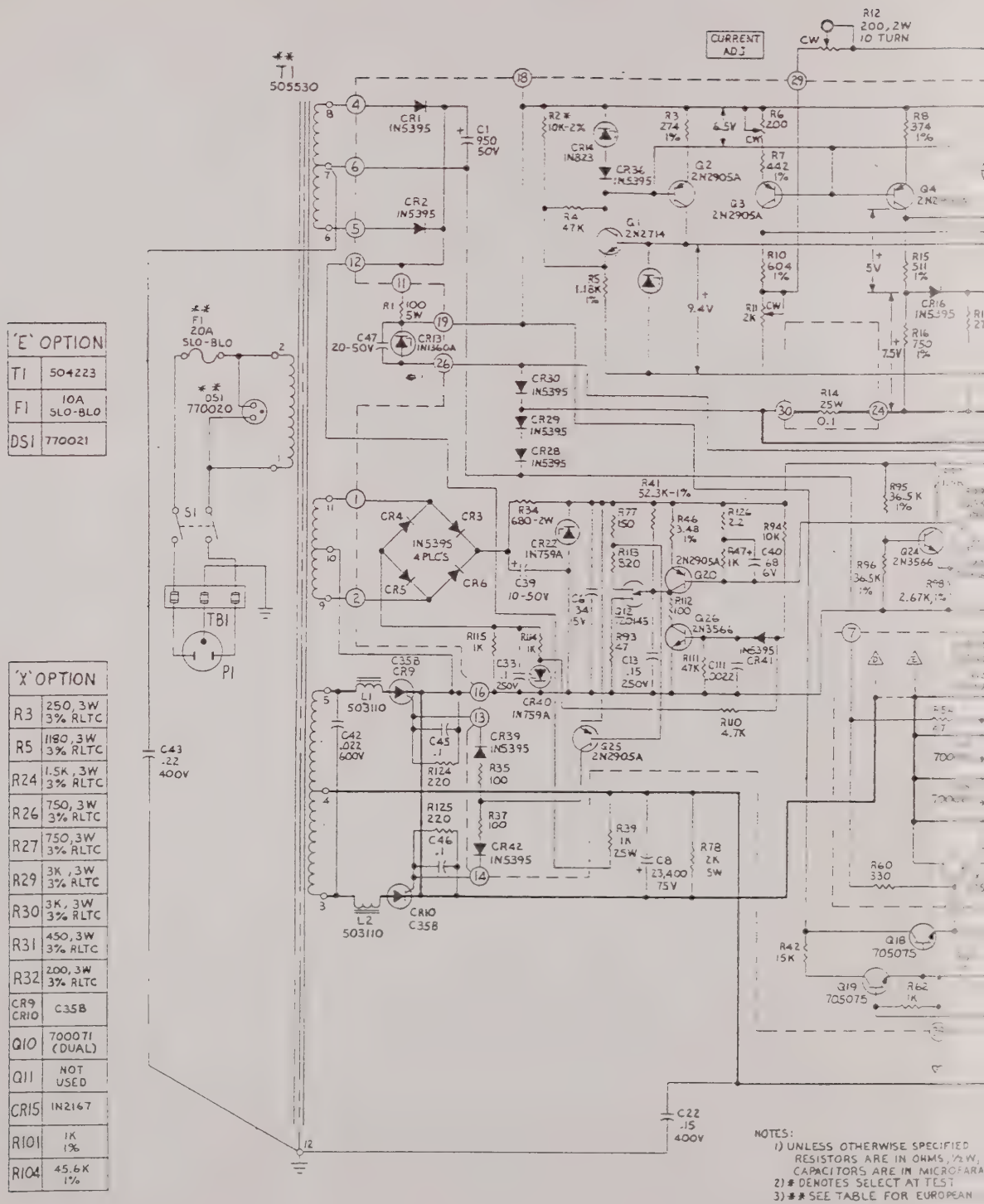
'X' OPTION	
R3	250, 3W 3% RLTC
R5	1180, 3W 3% RLTC
R24	1.5K, 3W 3% RLTC
R26	750, 3W 3% RLTC
R27	750, 3W 3% RLTC
R29	3K, 3W 3% RLTC
R30	3K, 3W 3% RLTC
R31	625, 3W 3% RLTC
R32	200, 3W 3% RLTC
CR9 CR10	C358
Q10	700071 (DUAL)
Q11	NOT USED
CR15	IN2167
R101	681 1%
R104	36.5K 1%

NOTES:
1) UNLESS OTHERWISE ... RESISTORS ARE IN OHM... CAPACITORS ARE IN MICR...
2) * DENOTES SELECT AT TE...
3) ** SEE TABLE FOR E...



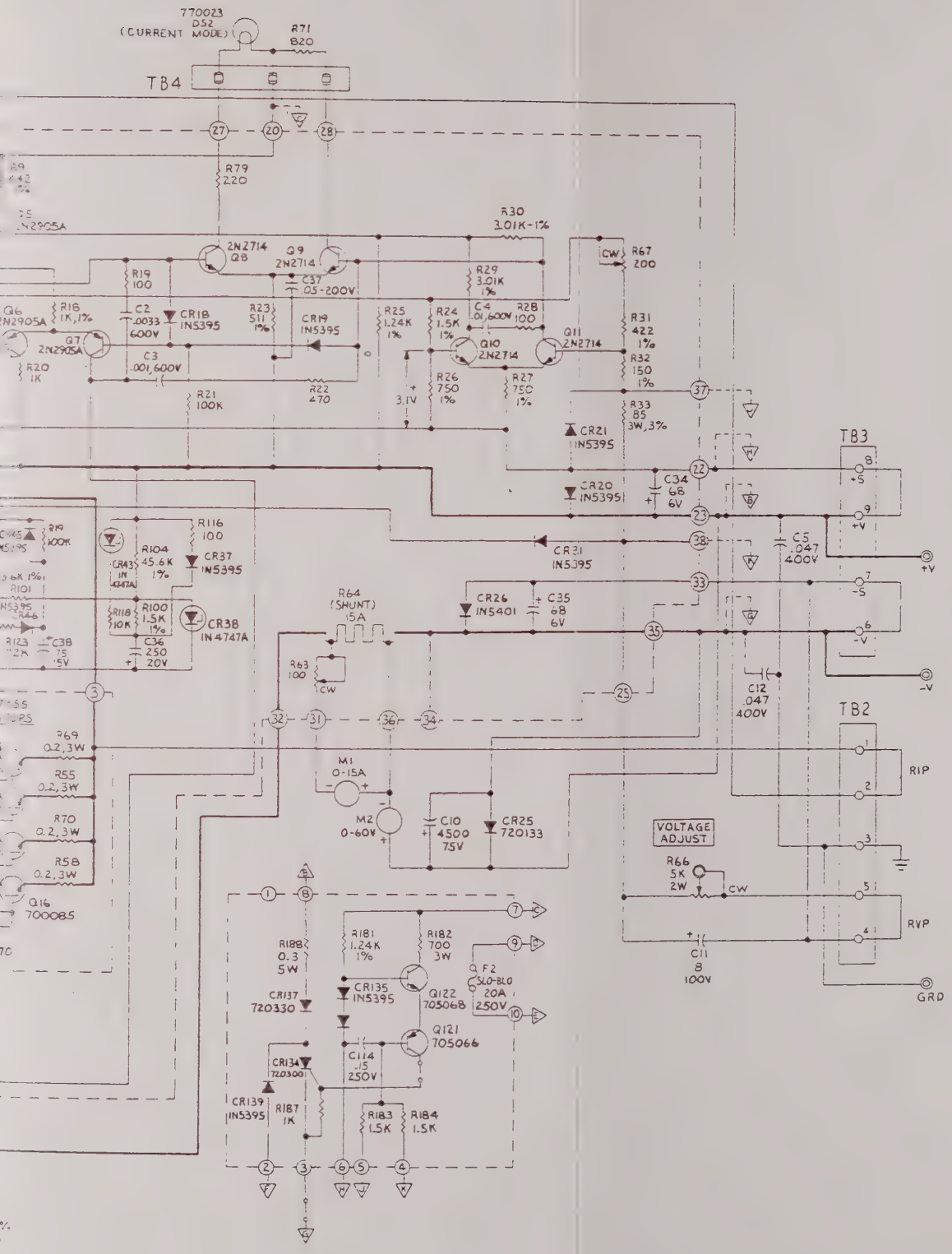
MODEL RS40-15 BOV

SCHEMATIC #12142002 Rev P



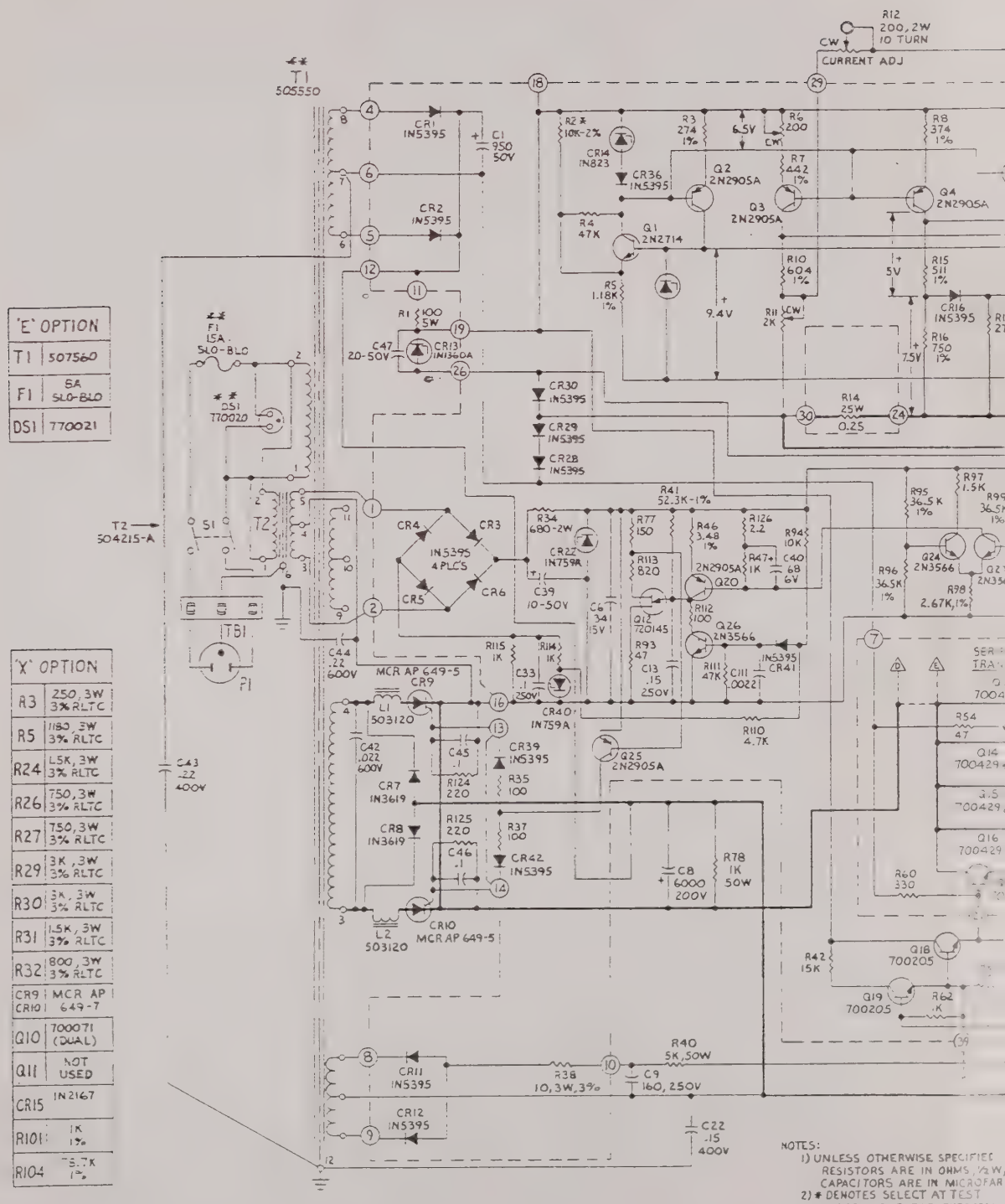
'E' OPTION	
T1	504223
F1	10A SLO-BLO
DS1	770021

'X' OPTION	
R3	250, 3W 3% RLTC
R5	1180, 3W 3% RLTC
R24	1.5K, 3W 3% RLTC
R26	750, 3W 3% RLTC
R27	750, 3W 3% RLTC
R29	3K, 3W 3% RLTC
R30	3K, 3W 3% RLTC
R31	450, 3W 3% RLTC
R32	200, 3W 3% RLTC
CR9 CR10	C35B
Q10	700071 (DUAL)
Q11	NOT USED
CR15	IN2167
R101	1K 1%
R104	45.6K 1%



MODEL RS60-12 BOV

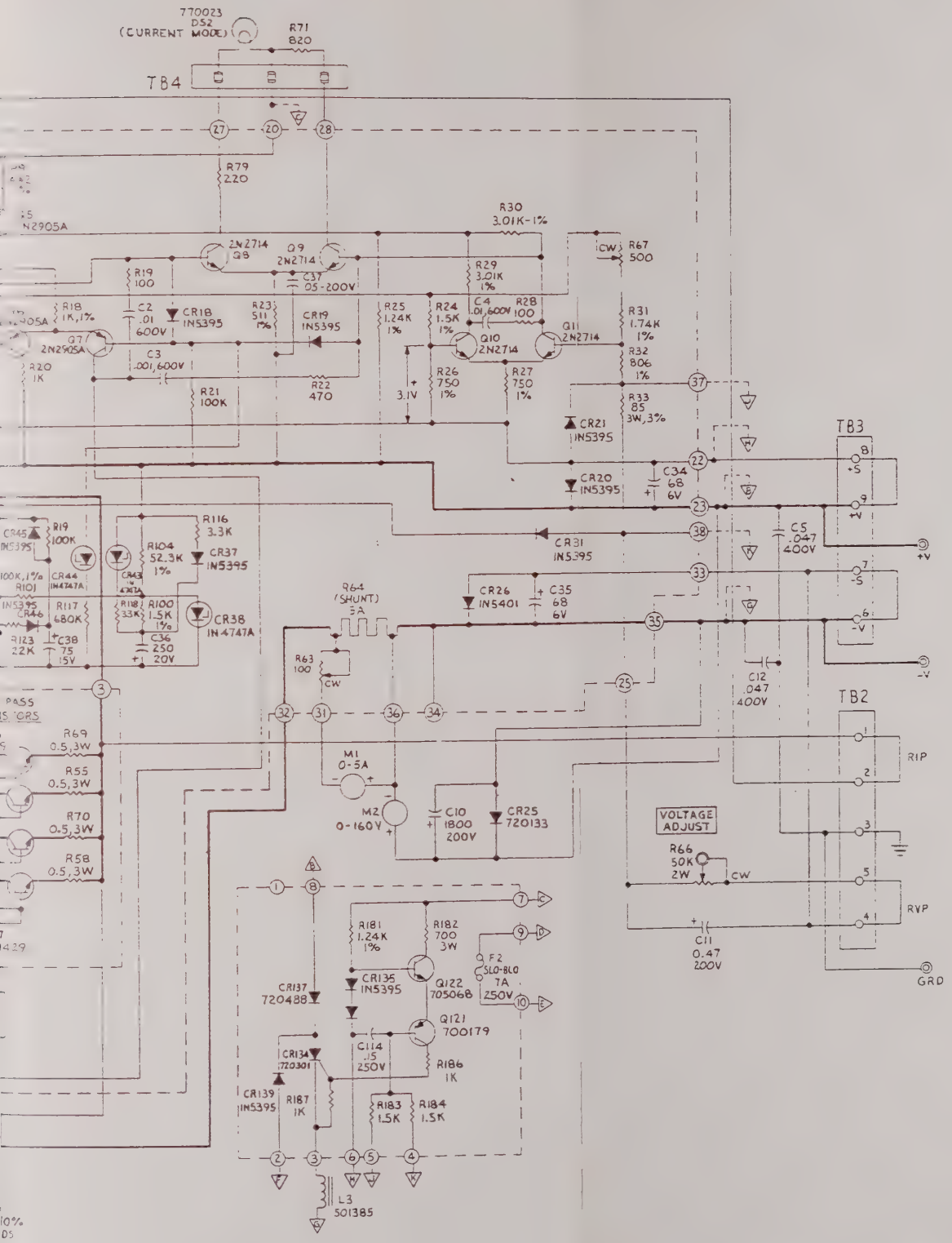
SCHEMATIC #12142003 Rev P



'E' OPTION	
T1	507560
F1	5A SLO-BLO
DS1	770021

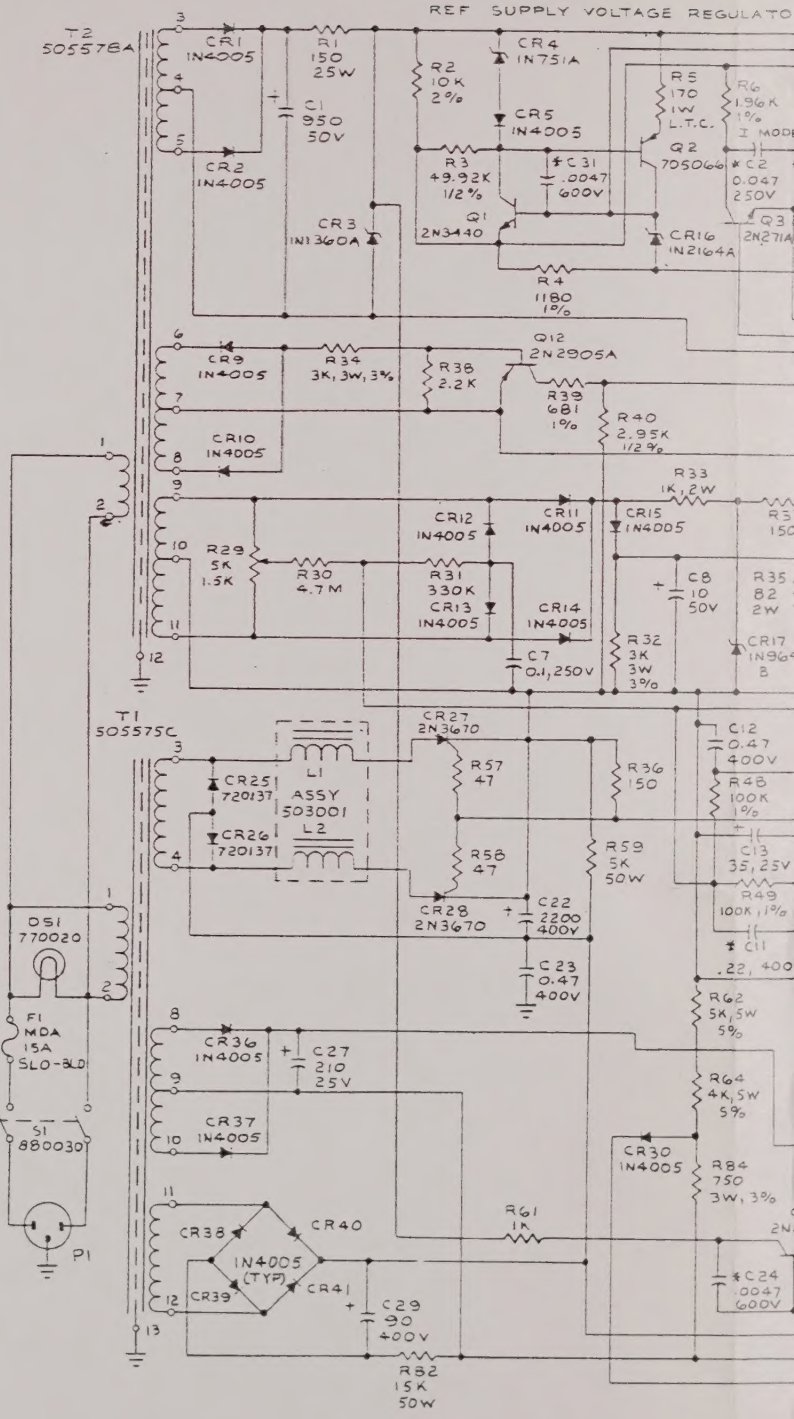
'X' OPTION	
R3	250, 3W 3% RLTC
R5	1180, 3W 3% RLTC
R24	1.5K, 3W 3% RLTC
R26	750, 3W 3% RLTC
R27	750, 3W 3% RLTC
R29	3K, 3W 3% RLTC
R30	3K, 3W 3% RLTC
R31	1.5K, 3W 3% RLTC
R32	800, 3W 3% RLTC
CR9 CR10	MCR AP 649-7
Q10	700071 (DUAL)
Q11	NOT USED
CR15	IN2167
R101	1K 1%
R104	3.7K 1%

NOTES:
1) UNLESS OTHERWISE SPECIFIED RESISTORS ARE IN OHMS, ½W, CAPACITORS ARE IN MICROFAR
2) * DENOTES SELECT AT TEST
3) ** SEE TABLE FOR EUROPEAN



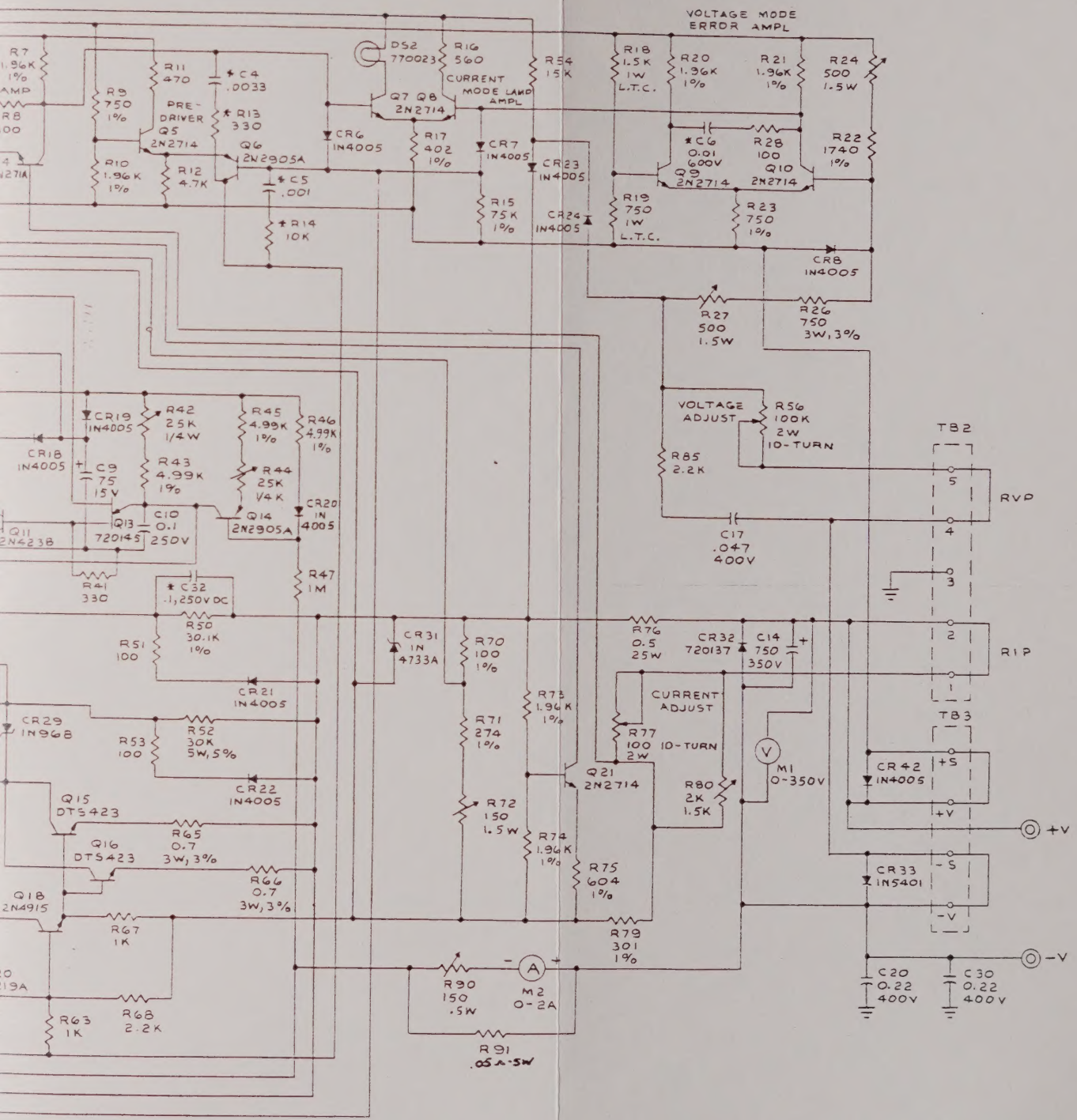
MODEL RS160-4 BOV

SCHEMATIC #12142004 Rev P



NOTE:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTORS ARE IN OHMS, 1/2W, 10%.
   ALL CAPACITORS ARE IN MICROFARADS.
2. * DENOTES SELECT AT TEST.



MODEL RS320-2C

SCHEMATIC #121220 Rev D